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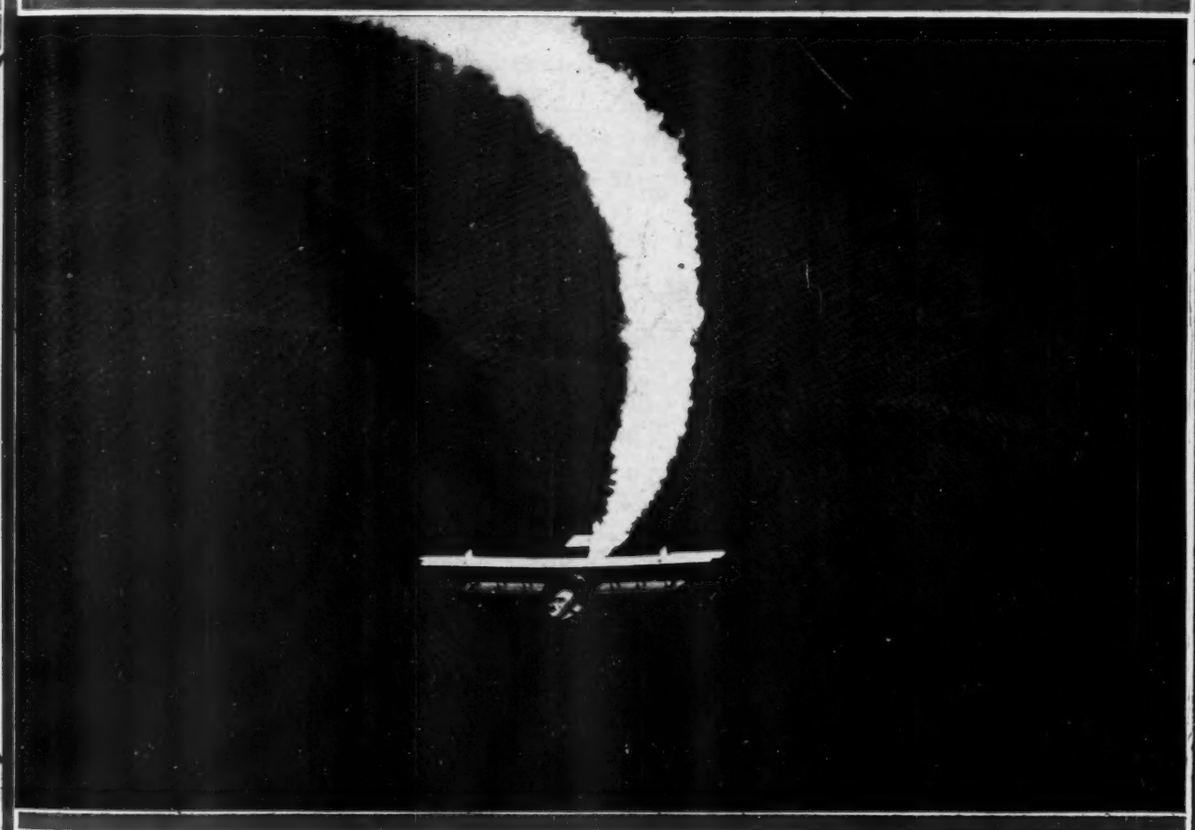
DECEMBER 24, 1923 Issued Weekly PRICE 10 CENTS



U. S. Naval flying boat laying a smoke screen

VOLUME XV

NUMBER 26

SPECIAL FEATURES

THE SUCCESS OF SKYWRITING

U. S. RIGID AIRSHIP ZR3 DESCRIBED

FOREIGN ENGINES FOR LIGHT PLANES

ANNUAL REPORT OF THE AIR MAIL SERVICE

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y.
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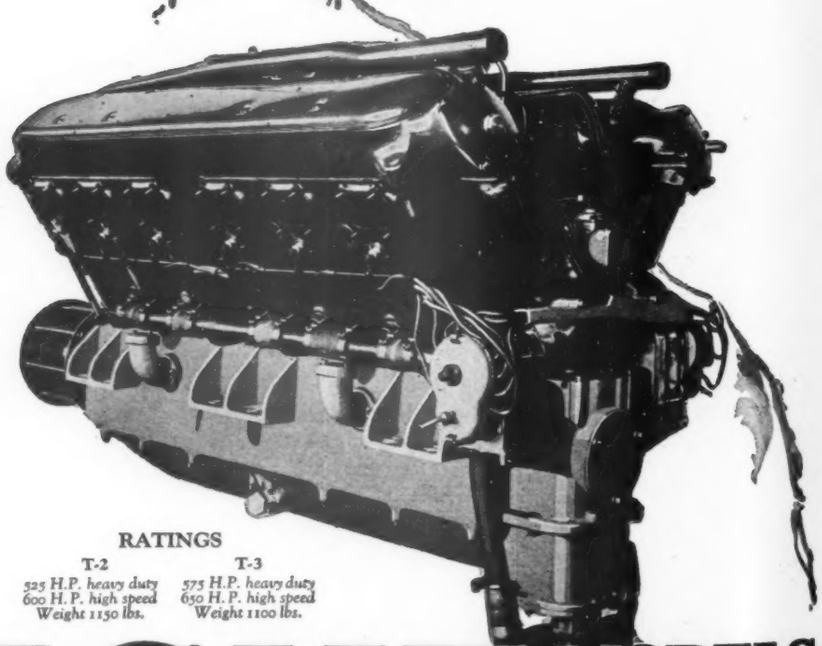

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WRIGHT T MODELS ENGINES

DECEMBER 24, 1923

AVIATION

VOL. XV. NO. 26

Published every Monday

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THE GARDNER, MOFFAT COMPANY, Inc., *Publishers*

Address all correspondence to

225 FOURTH AVENUE, NEW YORK

Publication office

HIGHLAND, N. Y.

Subscription price: Four dollars per year. Single copies ten cents. Canada, five dollars. Foreign, six dollars a year. *Copyright 1923, by the Gardner, Moffat Company, Inc.*

Issued every Monday. Forms close ten days previously. Entered as second-class matter Nov. 22, 1920, at the Post Office at Highland, N. Y., under act of March 3, 1879.

IN FAR AWAY CHINA

AVIATION Readers Encircle the World

The following letter has been received from Canton, China. It is typical of many that are received from readers throughout the world and shows how indispensible AVIATION is if a complete picture of the progress of American aeronautics is desired.

From an old Subscriber

"Enclosed please find ten dollars for which please renew my subscription to AVIATION. In the event that you have discontinued sending the magazine to my old address, please if possible send me the copies I have missed. AVIATION has been my greatest authority since the grass-cutter days of '16, as production manager of —— Works building airplanes during the war and later as field manager of a division of the Air Mail and now as aeronautical advisor to Dr. Sun Yat Sen in far away China.

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NATIONAL AIR

Independent authorities agree that the airplane is now ready for commercial transportation. A Martin Bomber, for instance, carrying 1600 pounds in addition to passenger weight, recently developed an average speed of more than 114 miles per hour.

Railroads have worked for years to clip minutes from their schedules. Present policy is even reducing rather than increasing speed. Travel by rail seems to be fixed for a long time to come at 60 miles per hour.

How will the development of the airplane affect the country? The railroads welded a loosely federated group of states into a nation. How closely knit will this nation become when its very air is nationalized?

Martin men not only feel the responsibility of maintaining their own leadership - but also the obligation, and the privilege, of building soundly for a whole people.

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Vol. XV DECEMBER 24, 1923 No. 26

Russia's Bid for Air Power

AVIATION has repeatedly called attention to the undeniable fact that Soviet Russia is making a serious and continuing effort to become a first class air power. Some recent news items, which appeared in the daily press as well as in British, French and Italian aeronautical magazines, indicate that these efforts are beginning to bear fruit.

The Russian air force, which two years ago was mounted on an extraordinarily heterogenous assortment of obsolete airplanes, is rapidly being equipped with up to date machines. All this new equipment, furnished by European manufacturers —Ansaldo observation planes from Italy, DH9A day bombers and Martinsyde fighters from England, Hanriot training planes from France—has for some time been streaming into Soviet Russia. And now a cable dispatch from the Hague announces that the Fokker Company is working on a Soviet order for 500 pursuit planes, and that large numbers of these ships have already been shipped to Russia after being passed on by a Russian testing commission which is staying at Amsterdam. In fact, should any doubt exist regarding the military nature of these ships—which have been camouflaged as "transport planes" in some newspaper reports—it will be sufficient to recall that the customs house at Riga, Latvia, recently detained a consignment of Fokker fighting planes destined for Moscow.

Military airplanes are of little use without well trained pilots. Hence, the report that one hundred and ten cadets of the Russian air force have just obtained their superior pilot's brevet at the Moscow military flying school will prove of timely interest. Nor is it less interesting to learn that the Council of Commissars has approved another emergency appropriation of 1,000,000 gold rubles for the purchase of military aircraft.

The encouragement given by the Soviets to commercial aviation is no less remarkable than their efforts in behalf of a strong air force. Our readers are familiar with the Moscow-Koenigsberg air line, which has now successfully been operated for about two years with Fokker cabin planes. The fleet of the "Deruluft," which operates this service, is now undergoing expansion, while other airways are being opened up by two new Russian air transport enterprises. One of these, called the Volunteer Air Fleet, has inaugurated a service between Moscow, Kharkoff and Odessa, using Dornier "Komet" cabin planes with Rolls Royce engines. The other company, the "Dobrolet"—which appears to be the air transport branch of the Russian Junkers enterprise— is engaged on the gigantic project of connecting Moscow, across Siberia, with Vladivostok, Russia's great seaport on the Pacific Ocean. A pioneer flight of 2200 miles' length has already been accomplished on this route toward the East, while other pioneer flights have been made into Central Asia and Persia with a view to linking up these regions with Moscow.

The breadth of vision of these projects is truly amazing, considering the financial status of Soviet Russia, but what is even more astounding is that these plans are actually being carried out. For those unfamiliar with Russian geography, suffice it to point out that the Moscow-Vladivostok project in point of distance and ground organization compares roughly with an airway from New York to Rio deJaneiro.

If American civil aviation had a spokesman in Congress, the paramount importance of pushing American air lines—and the Air Mail Service, in the first place—into Mexico, Central and South America could perhaps be impressed upon our law makers with sufficient force to make them vote the necessary appropriations. But as civil aviation is, strictly speaking, neither within the province of the Army, the Navy, the Post Office Department or the Department of Commerce, or any other government department, it would not be surprising if Vladivostok found itself linked up by air with Moscow and the rest of Europe long before American commercial aircraft will show the flag south of the Rio Grande.

A Great Loss

WHEN the cables brought word that Lawrence Sperry had in all likelihood been lost in the English Channel, the heart of every American airman was saddened. Not only had we lost one of our most capable pilots and ingenious aeronautical experimenters, but a friendly buoyant spirit whose natural element seemed to be the open spaces of the sky.

As a flier Sperry had no peer. He excelled in interpreting the meaning of every whim of aircraft. His pioneering spirit was ever present. The automatic stabilizer, the air flivver, the landing skid, contact flying, and more important than all else, the flying torpedo, will always be associated with his name. While not generally known, it was in connection with the latter development that he was in Europe. Not receiving sufficient recognition at home, he took the usual course of arousing interest abroad to create an impression here.

Everyone will feel a personal loss as the result of this tragic accident, for Lawrence Sperry probably had a wider circle of friends than any other American airman.

The Annual Air Mail Report

THE annual report of the Air Mail Service, which is printed in this issue, serves as a timely reminder of the wonderful work done year in, year out, by this service. The performance percentage of 96.72 made last year, shows what can be accomplished in commercial aviation by organizing ability.

It is hoped that Congress will bear this in mind when next year's Air Mail appropriations are discussed, and that it will grant this service the means for further developing its activities.

Review of Foreign Engines for Light Planes

Adaptation of Motorcycle Engines Giving Way to Special Horizontal and Vertical Types

The interest shown by many of our readers in the rapid strides the light plane movement is making in England and in France makes it timely to give here a brief review of the principal engines used for powering these small aircraft.

Very few engines have so far been specially designed for this purpose. Among these the Bristol "Cherub" engine, a full description of which appeared in our issue of March 19, 1923, deserves special mention for being the only low powered aero engine that successfully passed an endurance test of the kind to which large aircraft power plants are subjected.

Bristol "Cherub" Passes 50 hr. Test

This little engine, which was barred from the Lympne* meeting on account of its cylinder capacity, 1086 cu. cm.,

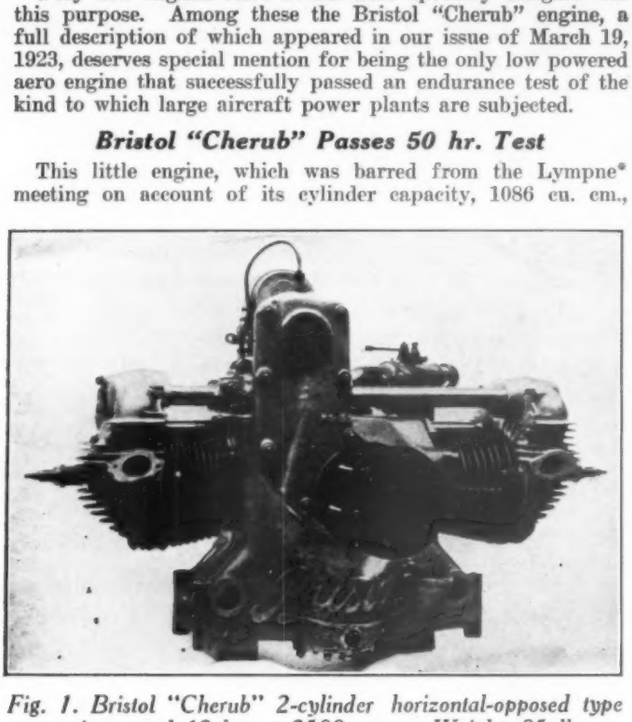


Fig. 1. Bristol "Cherub" 2-cylinder horizontal-opposed type engine, rated 18 hp. at 2500 r.p.m. Weight, 85 lb.

recently completed the 50 hr. "type test" of the British air ministry in one non-stop run at 90 per cent full power.

The tests were made on a Froude dynamometer. The average power developed during the run was 15.4 hp. at 2,200 r.p.m.; the average consumption of fuel for the 50 hr. was 9.7 pints of gasoline per hour, and 0.63 pints of oil per hour. Throughout the test the engine was cooled by a fan driven by the engine itself, and connected direct to the crankshaft. At the completion of the 50 hr. endurance test, without any dismantling or adjustment of the engine, the following power curve was taken:—

R.P.M.	*B.H.P.*
2460	19.2
2366	19.42
2360	19.68
2170	18.32
2040	17.68
1960	16.93
1900	16.6
1775	15.0
2450	19.6

The engine was then run for 1 hr. at full throttle, developing 18.5 hp. at 2,200 r.p.m. At the conclusion of these tests the engine was completely stripped, measured, and found to be generally in perfect condition.

The principal specifications of the Bristol "Cherub" engine are given in Table I. The ANEC light plane when it first came out was fitted with this engine, although for the purposes of the Lympne meeting—where the maximum cylinder capacity allowed was 750 cu. cm.—the plane was equipped with a 700 cu. cm. Blackburne engine.

*The word Lympne, as pronounced in England, rhymes with *swim*.—EDITOR.

Lack of special aircraft engines that would be within the cylinder limitation imposed, was responsible for the fact that at Lympne all the English contestants used motorcycle engines. While it is not believed that motorcycle engines will continue to be used much longer in this capacity, now that the light plane has definitely proved its right to existence, the specifications of the engines used in the Lympne machines will prove of interest. This is why they are given in Table II. English motorcycle engines are always specified in metric units, and that is how they are listed here. For purposes of conversion it is sufficient to state that one cubic centimeter (1 cu. cm.) equals 0.061 cu. in., and that one millimeter equals 0.039 in.

It will be noted that these engines are all of the two cylinder air-cooled type, with a very high crankshaft speed, which necessitates a reduction gear to the propeller. The figures given under "normal horsepower" are those used for flying purposes, and not as rated by the manufacturers for use on the road.

The English Motorcycle Engines

The A.B.C. engine was used in the "Wren" and ANEC light planes which divided first prize for greatest distance flown on one gallon (British Imperial) of gasoline, the performance being 87.5 mi./gal. The ANEC plane also won the altitude contest with 14,400 ft. On the Handley Page light plane this engine gave some trouble on account of unsatisfactory cooling, but this may have been due to the mounting.

The Blackburne engine powered the Avro biplane which won the aggregate mileage competition with a performance of 1000 mi., accomplished in eighty laps of a 12.5 mi. course. Inasmuch as a forced landing in this event meant that the pilot had to make a new start, this motorcycle engine will be found to have performed very remarkably in the air. Fitted

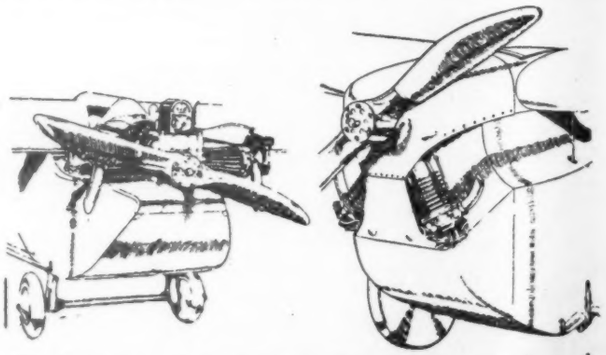


Fig. 2. Left, Douglas motorcycle engine mounted on the Handasyde light plane; right, Blackburne engine, mounted on the ANEC light plane

to the Gnosspelius "Gull" twin-screw monoplane, this engine did not prove so satisfactory, for the pilot had a forced landing on account of a cracked cylinder.

Three models of Douglas engines participated in the Lympne meeting, but specifications are available only for one, the 500 cu. cm. model. This particular model was fitted to the Parnall "Pixie" which won first prize for greatest speed attained, the figure being 76.5 mi./hr. The Avro light plane which won second altitude prize, with 13,850 ft., was also equipped with this engine. The other two types of Douglas engines did not perform so well. The 600 cu. cm. model fitted to the R.A.E. Aero Club "Hurricane," proved stubborn in starting, but the ship flew too little to permit of any intelligent comment on its power plant.

The 750 cu. cm. Douglas engine, with which two DH53's,

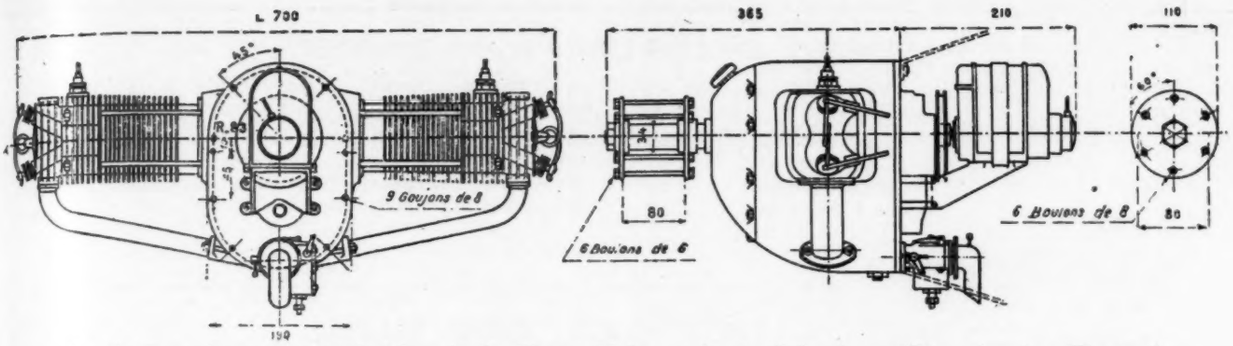


Fig. 3. General arrangement drawings of the Clerget 10 hp. engine for light planes (Dimensions in millimeters)

the Vickers "Viget," the Handasyde and one of the Parnall "Pixies" were fitted, was the least satisfactory of all. With the exception of the "Pixie," everyone of these ships had forced landings for one reason or the other (broken crankshaft, broken rocker arm and other non-specified causes).

No information is on hand with regard to the Grigg engine which powered one of the two Avro biplanes—a machine which flew very little—nor of the vertical two cylinder, two stroke, Carden engine with which the Gloucestershire "Gannett" was equipped. Engine troubles kept this plane mostly on the ground.

French Light Plane Engines

French engine manufacturers have developed quite a number of small engines for use in light planes, as shown in Table II, although several of these are adapted motorcycle and light car types. The Salmson and the Sergant are probably the best of the lot, although they have yet to pass an endurance test comparable to that accomplished by the Bristol "Cherub."

As will be seen from what follows, the first French light plane engines were all of the two cylinder horizontal-opposed, air-cooled type, and it is only recently that three and four cylinder engines of low power were produced. The reason for this evolution is obvious, considering that in a two-cylinder engine a missing cylinder cuts down the power one half, and furthermore unbalances the engine rather badly. The three cylinder radial type is less open to this objection, but even here the drawback of a missing cylinder is serious enough, in our estimation, to outweigh the advantage of low structural weight made possible by the use of a central or radial crankcase. French engine manufacturers seem to be fully aware of this point, for the latest Gallic light plane engines are of the four cylinder vertical type, while the appearance of five cylinder radial engines is already forecast.

Table II gives the specifications of those modern French light plane engines which have actually flown. It does not include a new Darracq which is believed to have recently been produced, but of which no particulars are on hand. Also, the Renault Co. is developing a two cylinder vertical water-cooled type, with a bore of 60 mm. and a stroke of 90 mm., which is expected to develop 10 hp.

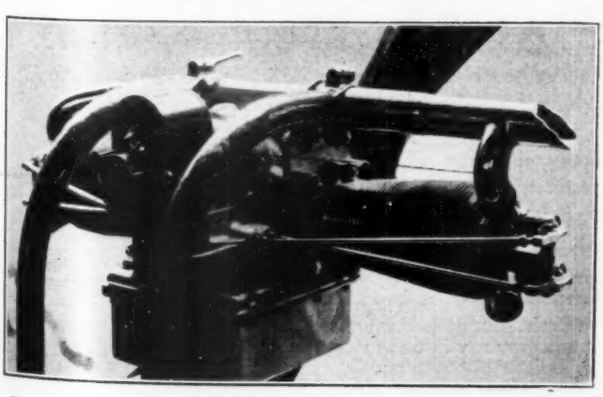


Fig. 4. Clerget 2-cylinder horizontal opposed type engine, rated 10 hp. at 1550 r.p.m. Weight, 60 lb. This engine, being an earlier model, differs in some particulars from the one shown above

The following notes will give our readers a general idea of the constructional features of the engines listed in the accompanying table, as well as of the qualities they have demonstrated in flight in various trials and competitions.

The Anzani has the distinction of having powered the first successful light plane, namely, the Dewoitine, which Barbot took up for its initial trials on April 5, 1923, at Toulouse, France. This is quite an historical date, considering that up to then the very idea of a "toy airplane" fitted with "coffee grinder" was scoffed at by the experts. Since then, and particularly in the light of the results obtained at Lympne, these experts have become singularly silent, while greatly improved light planes are being produced, even though not in the United States, we regret to say.

Little is known of the constructional features of this Anzani engine, which was originally rated 8 hp. at 1350 r.p.m. It gave too little reserve power to the Dewoitine, and the latter was thereupon refitted with a 12 hp. Clerget engine, which was the power plant used in the historic flight across the English Channel, May 6, 1923. The same Anzani engine was later fitted to the Belgian Poncelet light plane, but here, too, it was found to give too little power, and a Sergant engine was substituted for the Lympne meet.

Two Cylinder Horizontal Types

The Clerget engine used in the cross-Channel flight was built by the Renault Co. which holds the Clerget patents, for the Clerget-Blin Co. which built the war-time Clerget rotaries was dissolved a few years ago. This little engine was redesigned last summer, and the characteristics given in Table II are those of the new model, 2A. The accompanying schematic drawings give a general idea of this power plant. It will be seen that it is of the horizontal opposed type, with air-cooled fins. Although no photograph of the new engine is available, the illustration being that of the old model, this little engine seems very accessible. The crankcase is of aluminum, the pistons of aluminum alloy, while the cylinders and fins are of cast iron, with removable cylinder heads. The valves are operated by means of push rods. Lubrication is of the pressure type. The carburetor is equipped with an altitude control. A high tension magneto with variable advance is used. The power curve indicates 12 hp. at 1300 r.p.m., 13 hp. at 1400 r.p.m., 14 hp. at 1500 r.p.m., 15 hp. at 1600 r.p.m. and 16.5 hp. at 1800 r.p.m. The overall dimensions of the engine are as follows: Width crosswise, 0.700 m., depth, fore and aft, 0.595 m., height, 0.365 m. The propeller is direct-driven.

The Clerget 2A engine has successfully been used on various Dewoitine light planes, in particular at the "Grand Prix de la Moto-Aviette" and the Vauville meeting, last July and August.

The Gnome-Rhone two cylinder horizontal opposed engine, which was exhibited at the Paris Aero Salon, last winter, is admittedly an experimental job. It is characterized by a very high crankshaft speed, 3600 r.p.m., which is reduced on the propeller three to one by means of a planetary gear. It

TABLE I. ENGLISH LIGHT PLANE ENGINES

Make	Model	Type	Cyl. cap. cu. cm.	Normal hp.	Compression	Normal r.p.m.	Bore mm.	Stroke mm.	Weight lb.	Propeller drive
A.B.C.		2 cyl. horiz-opp.	397	7		4000	69	54	40	Geared
Bristol	"Cherub"	2 cyl. horiz-opp.	1086	18	4.5	2500	85	94	85	Geared 2-1
Blackburne		60 deg. V twin	698	20		3250	71	88	65	Geared 3-2
Douglas		2 cyl. horiz-opp.	500	17		4000			58*	Geared 2-1

*Not including flywheel.

TABLE II. FRENCH LIGHT PLANE ENGINES

(All these engines are of the air-cooled type.)

Make	Model	Type	Cyl. cap. cu. cm.	Rated hp.	Compression	Normal r.p.m.	Bore mm.	Stroke mm.	Weight lb.	Propeller drive
Anzani		2 cyl. horiz. opp.	1100	10		1550	90	78	90	Direct
Clerget-Renault	2A	2 cyl. horiz. opp.	1134	15		1600	85	120	60	"
Gnôme-Rhône		2 cyl. horiz. opp.		10		3600	68.5	54	40	Geared*
Salmson	AD3	3 cyl. radial	993	12	5.5	1800	70	86	75	Direct
Sergant		4 cyl. vertical	750	16		3200	54.5	80	100	Geared†
Vaslin		4 cyl. horiz. opp.	1094	15	6.5	1600	65	85	90	Direct

*Planetary reduction gear, 3 : 1.
†Geared to three speeds: 1275, 1410 and 1540 r.p.m.

also has an unusual bore-stroke ratio, the bore being larger than the stroke. In point of size it is probably the smallest aero engine ever constructed, but, as has been said before, it is still in the experimental stage. As far as known, no light plane has as yet used this power plant, although the Hanriot light plane was to be fitted with it.

Three and Four Cylinder Engines

The Salmson AD3, the schematic drawings of which are shown herewith, was specially designed for the Farman light plane which piloted by Lucien Coupet, won the 200 mi. Grand Prix race last July, near Paris in 4½ hr. This engine is essentially a scale reduction of a big aircraft engine. It is of the three cylinder radial type, with an aluminum alloy crankcase, steel cylinders, aluminum fins, and aluminum alloy pistons. The connecting rods are of chrome nickel steel. Both intake and exhaust valves are operated by pushrods. The carburetor is a Claudel, with a decompression device. Ignition is by Salmson magneto. Lubrication is of the pressure feed type. The propeller is direct-driven from the crankshaft extension. The normal rated horsepower is 12 hp. at 1800 r.p.m., with a fuel consumption of 250 g. and a fuel consumption of 150 g. per horsepower hour. The maximum horsepower is 16 hp. at 2400 r.p.m. The overall dimensions of this engine are as follows: Overall width and height, 0.65 m., depth, 0.55 m., including propeller hub.

A five cylinder radial engine, using the same cylinders, is under construction, and it may be followed by a seven cylinder radial model.

The Sergant engine, which appeared in public for the first time in French-Grand Prix for light planes, where it was powering two of the Farmans and the Breguet "Colibri," differs radically from the usual type of aircraft engine. This power plant is a four cylinder vertical air-cooled type, with an unusually small bore, large stroke, and high crankshaft speed. It is fitted with a reduction gear which allows of three propeller speeds for a given crankshaft speed, namely, 1275, 1410 and 1540 r.p.m. for the normal crankshaft speed of 3200 r.p.m. This engine is built very much like an automobile motor, and though it is quite heavy for the power developed, its reliability appears to be of a very high order. The crankcase is a duralumin casting, and the crankshaft is a manganese steel forging. Valves are of the overhead type, with overhead camshaft. The cylinders are bolted onto the crankcase in separate units. The engine is cooled by means of a scoop which directs the air flow from the propeller into the vertically grooved cylinder walls. Lubrication is by pressure feed with a gear pump. Overall dimensions are as

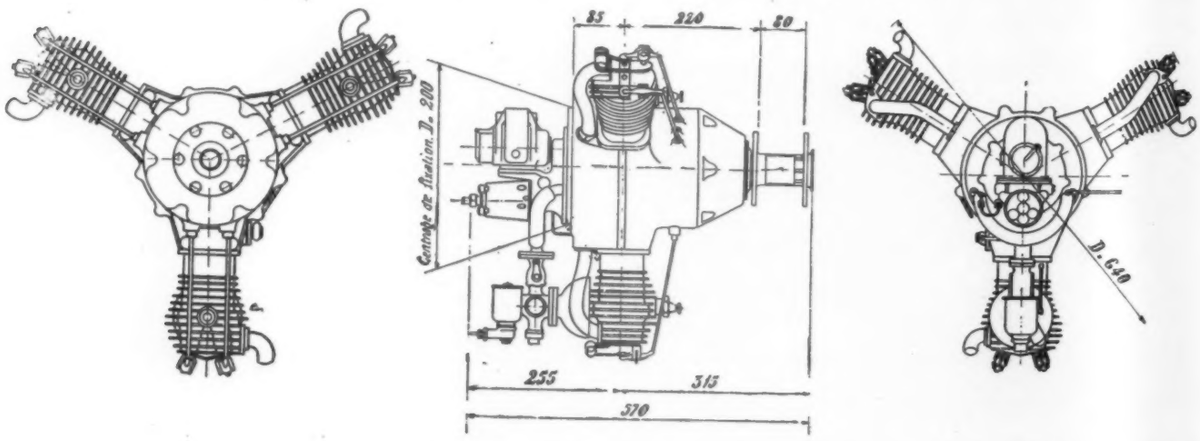


Fig. 5. General arrangement drawings of the Salmson 3-cylinder radial type engine for light planes, which is rated 12 hp. at 1800 r.p.m. Weight, 75 lb.

follows: Length, including propeller hub, 0.776 m.; height, 0.565 m.; width, 0.34 m.

The Vaslin engine, a modified cyclecar motor, is another interesting power plant in that it is of the four cylinder horizontal opposed type. The cylinders are arranged in pairs horizontally on both sides of the crankcase. From the viewpoint of encumbrance and facility of mounting in a fuselage, this type of engine is probably superior to all others, at any rate for small sizes. This cylinder arrangement was incidentally used on the 8 hp. Dutheil-Chalmers engine which powered the Santos-Dumont "Demoiselle" of fifteen years ago. The crankcase of the Vaslin engine is a casting of "alpax," a new aluminum alloy. The cylinders, with their air cooled fins, are machined of steel ingots although cast iron cylinders have also been used. Lubrication is of the centrifugal type. Overhead valves, actuated by pushrods, are used. The spark plugs are mounted in the front and rear walls of the cylinders. The general lines of this engine are remarkably clean. The normal rated power is 15 hp. at 1600 r.p.m., the maximum power being 20 hp. at 2400 r.p.m.

This engine was mounted on one of the Dewoitine light planes which participated in the Grand Prix and which was

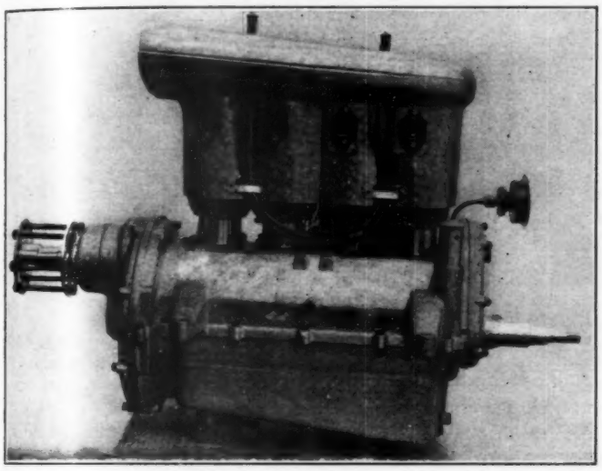


Fig. 6. Sergant 4-cylinder vertical type engine, rated 16 hp. at 3200 r.p.m. Weight, 100 lb.

later flown by Descamps from Paris to Vauville. Except for the exposed position of the spark plugs, which appear to be liable to short-circuiting from the rain—which happened in the Grand Prix—the engine appears to be reliable.

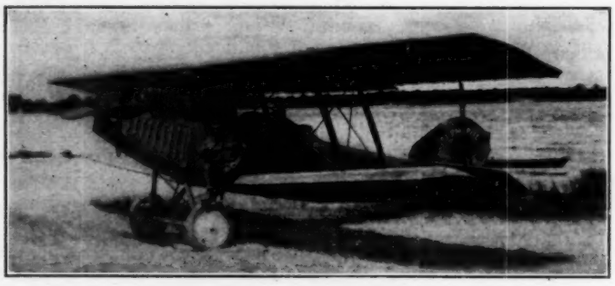
An engine of the same type, but developing 25 hp. is now under construction. It is to be used in thick wing monoplanes, its very small encumbrance making it particularly adaptable for mounting in the wings.—L. D'O.

The Heath "Favorite" Plane

The Heath "Favorite" was designed in the fall of 1921 by E. B. Heath, president of the Heath Airplane Co. of Chicago, and was completed the first part of November, 1922, the first flights being made on Armistice Day of that year. The machine has therefore just completed one year of practical service, proving that the details of construction, which deviate from the conventional in many respects in this machine, are correct.

The "Favorite" was designed for various kinds of work, one of the principal points developed in detail being the night flying equipment. The lower wings are lighted internally and the bottom surface left frosted so that signs can be easily painted on the lower surface and clearly distinguished at night. The ship is further equipped with searchlights at the tips of the lower wings, mounted on swivel joints and adjustable from the pilot's cockpit, to assist in landing.

One of the original and unique points in the design of the machine is the trussing of the wings. It will be noted that the inter-plane struts slant inwardly, thereby decreasing the length of the bay on the top wing and increasing the amount of over-hang. The wings have the Glenn Martin No. 2 section, as this was one of the first thick wing sections to come out at the time the machine was designed. This allows for a very deep spar, with a 5 ft. chord. Tests show that these spars have a high factor of safety, and that they are extremely light and with maximum cross section. However, it was found on direct compression the spars would not stand as much as



The Heath "Favorite" plane, with its pilot, W. W. Meyer, sitting on one wing

the same solid spars, as the crushing point of the spar was reached sooner on account of the minimum amount of wood in the cross section of the spar.

To minimize this compression on the top spar, they are slanted in; this decreases the length of the bay on top and gives the flying wires a better angle of pull, which also tends to decrease the compression on the top spars. It further lightens the load on the flying wires as well as shortens them by developing a semi-cantilever action in the top wing, due to the great amount of overhang. The struts, slanting outward on the lower wing, make this wing very rigid, as this has been found necessary in handling the ship around the field. By putting all of the dihedral on the bottom wing, much more ground clearance has been given to the wing tips, so that in taking off in a cross wind there is very little chance of the wing getting low enough to scrape the ground. This eliminates the necessity of wing skids.

In order to keep the structural weight as low as possible, all longerons and struts which are sectional or rectangular, have been made hollow, or box section, which gives the maximum strength per weight. The turtle back and cockpit cowls are of plywood construction.

The machine is equipped with four ailerons, and practically fifteen per cent of the total wing surface is aileron surface, which makes the ship extremely maneuverable in all kinds of weather. The rudder is as large as used on machines of much greater size. The landing gear has a short swivel axle on each side with the conventional standard type shock absorbers. The swivel axle gives a much quicker action to the wheels when going over bumps or holes.

In the On-to-St. Louis race this machine carried four passengers and pilot, scoring 213 points as against 216 made by Casey Jones, the winner. Considering the fact that the ship was delayed at Chanute Field for one hour on account of engine trouble, this is a very good performance. The log book shows that in the period of one year the machine has flown 250 hr., during which time five different OX5 motors were installed.

Detailed specifications are as follows:

Span	33 ft., upper wing. 30 ft., lower wing.
Chord	5 ft.
Area	300 sq. ft.
Weight	1400 lb., dry.
High speed	85 mi./hr.
Low speed	36 mi./hr.
Useful load	700 lb.
Motor	OX5, 90 hp.

A Wonderful Performance

"Ten airplanes, *including the pilots,* joined the revolt headed by General Estrada," says the New York Times.

Those intelligent airplanes!

Annual Report on the U. S. Air Mail Service

Mail Planes Flew 1,800,000 Mi. with 67,800,000 Letters Making 96.72 Per Cent Performance

The annual report of the Postmaster General, just made public, contains some very interesting information on the operation of the Air Mail Service during the fiscal year ended June 30, 1923. This is reproduced below.

The operation of Air Mail Service during the period under review was confined to one transcontinental route from New York to San Francisco. Landing fields on this route are located at New York, N. Y.; Bellefonte, Pa.; Cleveland, Ohio; Bryan, Ohio; Chicago, Ill.; Iowa City, Iowa; Omaha, Nebr.; North Platte, Nebr.; Cheyenne, Wyo.; Rawlins, Wyo.; Rock Springs, Wyo.; Salt Lake City, Utah; Elko, Nev.; Reno, Nev., and San Francisco. The total length of the route is 2,680 mi.

The appropriation for the year for the service was $1,900,000; the expenditures were $1,774,151.85.

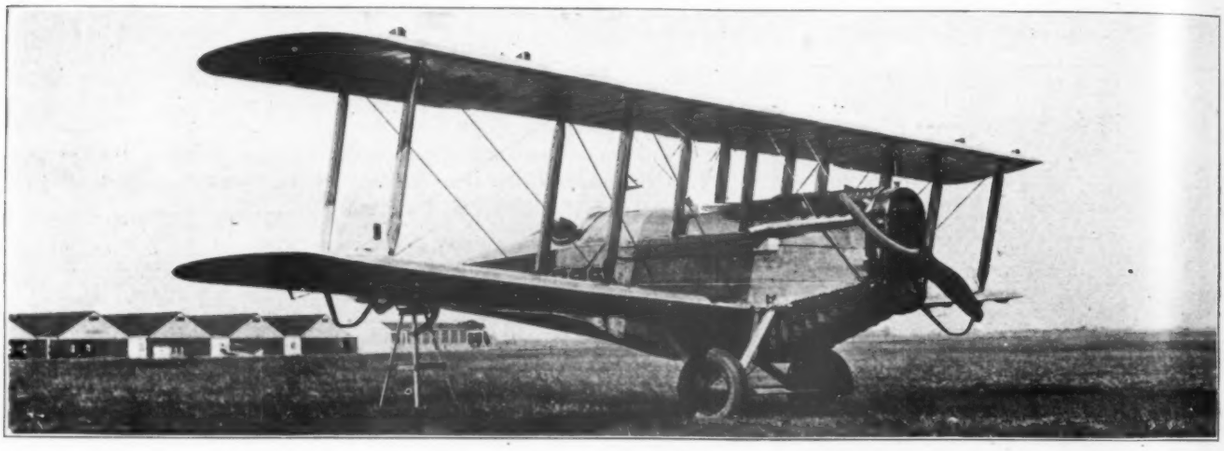
During the year a total of 1,809,028 mi. were flown by Air Mail planes carrying an estimated total of 67,875,840 pieces of first-class mail. A performance percentage of 96.72 was made for the year's operation.

Certain valuable additions to the ground preparation of the route were made, notably a warehouse, repair base, and hangars being erected at Chicago, Ill. Practically all the work that is necessary in the preparation of a lighted airway between Chicago and Cheyenne has been done and successful tests have been made. A service over this route under these conditions will be the first attempt made in the world to operate aircraft at night on a regular schedule.

On June 30, 1923, the Air Mail Service had 79 airplanes in flying condition.

The Air Mail Service inventory, as of July 1, 1923—when fifteen fields and fourteen radio stations were equipped—is as follows:—

Buildings:		
Repair depot and warehouse (1)	$200,000	
Hangars (9)	103,640	
Shops (5)	6,300	
Offices (9)	10,414	
		$320,354
Field improvements (cinder runways, tile drains, macadam roads, etc.)		100,000
Office equipment (furniture, typewriters, file cases, etc.)		6,150
Field equipment (machinery, tools, etc.)		79,783
Airplanes (79)		592,500
Airplane motors (545)		1,090,000
Motor vehicles (95)		38,649
Supplies and materials in stock rooms		310,990
Gasoline on hand July 1 (33,187 gal.)		8,296
Oil on hand July 1 (6,829 gal.)		4,097
Mileage scrip on hand		5,917
Night flying equipment (lamps, generators, etc.)		232,976
Radio:		
Office buildings (10)	$10,700	
Office equipment	1,840	
Radio equipment (14)	59,240	
		71,780
		$2,861,492



U. S. mail plane No. 299, the "flying workshop" of the service, on which improvements are tested in actual operation. In its latest form—which cannot yet be illustrated—this ship carries 1000 lb. of pay load at a maximum speed of 120 mi./hr. with a Liberty engine and Aeromarine high lift wing

Consolidated statements showing the performance and total expenditure for operation and maintenance of the Air Mail Service for the fiscal year ended June 30, 1923, are shown in Tables I and II.

TABLE I.—PERFORMANCE OF THE AIR MAIL SERVICE FOR FISCAL YEAR ENDED JUNE 30, 1923

Month.	Trips possible (scheduled).	Trips defaulted.	Trips attempted.	Trips uncompleted.	Weather encountered. Trips in fog, etc.	Trips clear	Milcage possible (scheduled).	Miles traveled with mail.	Miles ferry and test.	Total miles traveled.	Per cent of performance.	Mail carried (number of letters).	Cost of service.	Forcedlandings due to Mechanical causes.	Forcedlandings due to Other causes.
1922.															
July	675	0	675	2	203	472	134,000	133,809	8,620	142,429	99.86	4,793,840	$88,427.65	11	6
August	729	0	729	0	205	524	145,896	145,896	14,485	160,281	100.00	5,401,440	121,270.00	8	6
September	688	2	686	1	187	499	136,562	135,997	10,334	146,331	99.59	6,160,160	126,075.56	15	13
October	706	3	703	9	255	448	139,977	138,307	38,606	176,913	98.80	6,125,800	341,770.51	22	15
November	677	24	653	18	349	304	134,182	127,805	17,029	144,834	95.24	5,593,120	98,686.71	20	37
December	674	45	629	21	394	235	133,760	123,070	25,167	148,237	92.01	5,189,840	103,649.95	10	37
1923.															
January	702	40	662	20	382	280	139,360	129,289	12,665	141,954	92.77	5,695,960	146,067.44	14	36
February	621	38	583	13	292	291	123,280	114,424	14,749	129,173	92.81	4,921,920	100,319.45	22	34
March	729	24	705	22	356	349	144,720	137,200	16,768	153,968	94.80	6,537,720	147,965.95	12	38
April	675	23	652	9	323	329	134,000	128,483	11,290	139,773	95.88	6,118,120	235,219.01	12	24
May	702	4	698	3	312	386	139,360	138,085	16,759	154,844	99.08	5,599,200	173,723.59	13	19
June	702	2	700	4	312	388	139,360	138,272	31,919	170,191	99.21	5,738,720	213,975.76	17	14
Total	8,280	205	8,075	122	3,570	4,505	1,644,457	1,590,637	218,391	1,809,028	96.72	67,875,840	1,897,151.58	176	279

TABLE II.—TOTAL EXPENDITURE FOR OPERATION AND MAINTENANCE OF THE AIR MAIL SERVICE FOR THE FISCAL YEAR ENDED JUNE 30, 1923

Month	Wages and salaries of all employes	Pilots' mileage pay	Cost of gasoline and oil purchased	Repair parts and material purchased	Tools, machinery, and equipment purchased	Rent, light, fuel, power and water	Building and field improvements	Telephone and telegraph
1922.								
July	$52,445.50	$7,825.63	$17,397.28	$4,221.45	$338.45	$1,154.58	$300.46	$353.95
August	53,844.04	8,683.45	17,881.48	13,146.67	1,416.47	2,094.68	18,171.30	379.15
September	55,146.01	7,989.26	17,316.90	8,315.94	1,111.16	2,709.27	27,065.57	365.76
October	56,125.83	9,683.65	18,808.79	18,055.13	1,117.31	2,433.26	226,661.29	519.91
November	56,630.80	8,067.49	14,147.79	5,064.34	2,034.13	2,844.12	3,639.14	461.55
December	57,185.18	8,169.67	13,271.42	6,789.51	2,390.29	3,378.99	4,689.56	359.41
1923.								
January	55,813.01	7,876.87	14,018.37	15,415.53	34,052.52	2,854.40	6,278.27	540.94
February	53,742.98	7,279.16	12,136.40	3,635.51	10,096.11	4,245.81	1,605.21	380.42
March	54,823.80	8,746.80	18,136.74	3,223.33	11,359.88	6,085.99	36,550.95	521.80
April	57,420.27	7,950.58	12,923.76	21,674.93	107,028.64	2,626.35	14,454.98	550.87
May	60,145.36	9,075.65	15,652.93	4,110.43	10,010.42	2,941.37	65,318.91	868.21
June	63,623.12	9,979.48	14,669.05	10,851.21	29,777.58	3,314.09	69,060.48	1,154.00
Totals	676,945.90	101,327.69	186,360.91	114,503.98	210,728.96	36,682.91	473,796.12	6,455.97

Month	Expenses in connection with forced landings	Freight and express	Mileage scrip used	Expense accounts	Miscellaneous	Total expenditures	Gallons of gas issued to planes	Total flying time Hr.	Min.	Total miles flown
1922.										
July	$83.33	$849.72	$942.79	$1,691.10	$823.41	$88,427.65	41,956	1,515	39	142,429
August	116.47	529.69	914.46	2,002.16	2,089.98	121,270.00	43,542	1,706	27	160,381
September	154.20	1,252.98	1,001.91	2,541.90	1,104.70	126,075.56	40,430	1,550	34	146,331
October	147.15	2,338.37	1,536.33	3,411.09	936.40	341,770.51	47,574	1,893	09	176,913
November	277.98	1,199.67	1,074.90	2,225.35	1,019.45	98,686.71	39,819	1,534	42	144,834
December	717.19	849.72	1,724.74	2,238.44	1,885.83	103,649.95	40,634	1,524	03	148,237
1923.										
January	403.90	3,007.09	2,253.34	2,405.29	1,147.91	146,067.44	39,273	1,485	29	141,954
February	342.92	2,760.27	1,618.58	2,113.65	362.43	100,319.45	36,331	1,318	06	129,173
March	311.48	3,269.57	1,846.46	2,800.70	288.45	147,965.95	42,522	1,587	09	153,968
April	163.14	3,862.94	1,154.12	2,944.36	2,464.07	235,219.01	39,400	1,361	36	139,773
May	308.83	1,308.07	1,010.79	2,228.95	743.67	172,723.59	42,894	1,629	39	154,844
June	1,518.30	5,389.30	1,719.49	2,588.34	331.32	213,975.76	47,102	1,801	00	170,191
Totals	4,544.89	26,617.39	16,797.91	29,191.33	13,197.62	1,897,151.58	501,777	18,907	33	1,809,028

Note—Cost per mile entire service, $1.0487.

Speaking of the future of the Air Mail Service, the report says:—

"Before the Air Mail Service can offer to the department its full measure of value it will be necesary to operate the planes at night as well as in the daytime. Its value as a postal transportation agent lies in its high speed, but to compete with the railroad train it must exceed the overnight distance limit of the train. Night flying, if successful, will accomplish this.

"Accordingly the Air Mail Service undertook an intensive study of night operation in all its phases. It was found that there had been no regular operation of aircraft at night excepting that which took place during the war. However, the department availed itself of all obtainable information and competent advice, and received the cooperation of manufacturers, of the Army Air Service laboratories, and the National Advisory Committee of Aeronautics.

"After several months of research work a plan was reached for lighting the course between Chicago, Ill., and Cheyenne, Wyo., for the location of emergency fields and the lighting of these and the regularly established landing fields and buildings. All this involved special devices and expert handling for lighting to approximate day lighting and daytime perspective.

"Ten of our regular mail-carrying planes were equipped with appropriate lighting devices, and the official test was made for four days beginning Aug. 21, and maintained between New York, N. Y., and San Francisco, Calif.

"The service was operated in both directions and proved an entire success, with schedules 26 hr. 14 min. eastbound, and 29 hr. 38 min. westbound (best time).

"The experiment demonstrated that it is feasible and practicable to operate aircraft at night over properly lighted and prepared airways, and with a speed practically equal to that maintained during daylight."

Wide World Photo

Howard Calvert, stunt pilot, and Frank O'Neil, his manager, arrested by Flying Policeman Kullenberg of Akron, Ohio, for violation of city's anti-stunt ordinance

Collier Trophy Awards

Following is the list of awards to date of the Collier Trophy:—

1911—To Glenn H. Curtiss for development of the float seaplane.

1912—To Glenn H. Curtiss for development and demonstration of the flying boat.

1913—To Orville Wright for development and demonstration of his automatic stabilizer.

1914—To Elmer A. Sperry for development and demonstration of gyroscopic control.

1915—To W. Starling Burgess, for development and demonstration of Burgess-Dunne seaplane.

1916—To Elmer A. Sperry for development and demonstration of Sperry drift set.

No award from 1917 to 1920 on account of the war.

1921—To Grover C. Loening for development and demonstration of his air yacht.

1922—To the personnel of the U. S. Air Mail Service for completing a year's operation from coast to coast without a single fatal accident.

Skywriting -- A Successful Commercial Activity

Planes of Skywriting Corporation of America Extend Operations over Entire Country

Photo Sussman-Skywriting Corp. of America

A skywriting SE5A plane

Among the commercial activities in which airplanes are being used with marked success, skywriting work for purposes of advertisement and publicity, though of comparatively recent origin, has quickly risen to a place of considerable importance. Though this phase of commercial aviation is but a year old, its successful growth in this country, through the nation-wide activities of the Skywriting Corp. of America, with headquarters at 50 E. 42d St., New York, has been very rapid.

The Equipment

In January of this year one skywriting plane of this firm commenced commercial operations. Today fourteen planes have been equipped for skywriting, and twelve are in active use. The machines are SE5a single-seaters fitted with 220 hp. Wolseley "Viper" engines, and have a high speed of 125 mi./hr. and a climb of 10,000 ft. in 11 or 12 min. Each of these planes has now flown approximately 150 hr., making a total flying time for the Skywriting fleet of 1800 hr. During this time every plane has been equipped with either a new engine or one that has been completely overhauled.

Skywriting planes have flown over territory from Bangor, Me. to San Diego, Calif. and from Seattle, Wash. to Jacksonville, Fla., and have written messages in the sky over nearly every important city and state in the Union, with the exception of one or two Middle Western states where there are no flying facilities at all.

An idea of the great distances covered by Skywriting planes is best illustrated by the flight of Pilot C. B. D. Collyer, who recently reached San Antonio, Tex. Collyer started from New York and flew to San Antonio via Cleveland, Chicago, Davenport, St. Paul, Minneapolis, Kansas City, Wichita, Oklahoma City, Fort Worth, Dallas and Waco. He had no trouble of any kind on this long flight and gave skywriting demonstrations over all the big cities en route.

The Operating Bases

The main base of the Skywriting Corporation is at Curtiss Field, Garden City, one of the largest hangars on the field, together with a smaller hangar, being occupied by its ships. At Framingham, Mass., the company has rented from the State the former Army Air Service flying field and has built a hangar for the housing of the skywriting planes. For operations in Pennsylvania and New Jersey, a field at Glendale Farm, Kirkwood, N. J., has been rented and a hangar erected by the company. In Illinois, the skywriting pilots have their own hangar, located at Ashburn Field, which is operated by the Aero Club of Illinois. On the Pacific Coast flying operations are carried on from Los Angeles.

Allan J. Cameron, president of the Skywriting Corporation, became interested in skywriting while on a trip to Europe in the fall of 1922. Maj. Jack Savage, of London, England, who is the inventor of the present form of skywriting, gave his first public demonstration in England in May of that year. Mr. Cameron, realizing the immense possibilities of this type of advertising in America, promptly entered into negotiations with Major Savage, and these culminated in the creation of the American company.

Major Savage and Mr. Cameron have created an organization of famous pilots for skywriting operations. Seven of them are attached to the American company—Captains

The staff of the Skywriting Corp. of America—(L. to R.) Maj. Jack Savage, Capt. G. A. Lingham and Allan J. Cameron, president of the company

Cyril Turner, A.F.C., G.A. Lingham, D.F.C., E.D.C. Herne, George F. Bradly, Leslie Tait-Cox, C. R. McMullin and C.B.D. Collyer, all well-known pilots with brilliant war records. Pilot Collyer was formerly a well known flier in the U. S. Air Mail Service before joining the Skywriters, while Captains Herne, McMullin and Bradly were pilots for Handley Page Transport, Daimler Airway and Instone Air Line, respectively, on the European passenger routes.

The ground organization of the Skywriting Corporation consists of nineteen expert mechanics, riggers, etc., under the direction of Superintendent George Cook. There are also two representatives attached to the company, who proceed ahead of the units and arrange for landing fields and supplies.

It is interesting to note that every man in the Skywriting company saw service during the World War.

An Interesting Engine

The Peugeot Automobile Co. of Paris, France, is reported to have completed the construction of a new aircraft engine that will burn vegetable and heavy oils. This engine is of the two stroke, two cylinder type, and is expected to develop 60 hp. at 1500 r.p.m. The weight, dry, is said to be 4.4 lb./hp.

The engine is of the semi-Diesel type and uses a compression of 21 atmospheres. It can be started "cold," the initial "firing" being done by a short piece of platinum wire, mounted in the combustion chamber and heated to white heat by means of electricity furnished by a small storage battery. It has intake and exhaust ports, and the scavenging is done by a small compressor. The fuel oil is injected at a high pressure.

Block tests of this motor will take place shortly. In the meantime it is interesting to learn that the Peugeot Co. will shortly send several caterpillar automobiles on a trip across the greater breadth of Africa, from Dakar to Capetown, and thence to Cairo and Constantinople, for the purpose of testing an automobile engine substantially similar to the aircraft motor described above. This engine will burn vegetable oils which are either readily available in Africa or can be quickly produced on the spot.

The French government is giving strong encouragement to the development of power plants for automotive vehicles that will operate on fuels other than gasoline, inasmuch as the world's principal oil wells are all controled by American or British interests, and it is felt that these sources of supply might not remain available in case the United States or the British Empire were involved in a war.

New Members A.C.C.

The following corporations and individuals were recently elected to membership in the Aeronautical Chamber of Commerce of America, Inc.:—

Class B

Hammacher, Schlemmer & Co., hardware, New York City
The Moto-Meter Co., industrial thermometers, Long Island City
Night Aero-Advertising Corp., New York City
W. Harris Thurston & Co., Inc., fabrics, New York City
Titanine, Inc., dope, Union, N. J.

Class C

Ethel Bailey, L.W.F. Engineering Corp.
Joseph F. Meade, Curtiss Aeroplane & Motor Co.
Sikorsky Aero Engineering Corp., New York City

N.A.A. Committees for 1924

The National Aeronautic Association has just announced the personnel of the various standing committees for the present year. The names of these officers, appointed by Frederick B. Patterson, president of the the N.A.A., and approved by the Executive Committee, are given in the right hand column.

N.A.A. OFFICERS FOR 1924

President
Frederick B. Patterson
Vice-President
Ralph H. Cram
Treasurer
B. F. Castle
Secretary
Dudley M. Outcalt

Finance Committee
Howard E. Coffin, Detroit, Mich.
Col. B. F. Castle, New York City
Godfrey L. Cabot, Boston, Mass.
C. F. Kettering, Dayton, Ohio
Edsel Ford, Detroit, Mich.
Carl F. G. Meyer, St. Louis, Mo.
Cecil B. DeMille, Hollywood, Calif.

Contest Committee
Col. F. P. Lahm, Washington, D. C.
B. Russell Shaw, Washington, D. C.
Carl Schory, Washington, D. C.
Porter Adams, Boston, Mass.
C. G. Peterson, Paterson, N. J.
Comdr. M. A. Mitscher, Washington, D. C.
James A. Meissner, Birmingham, Ala.
Glenn L. Martin, Cleveland, Ohio
Ralph Upson, Detroit, Mich.
R. W. Schroeder, Chicago, Ill.
Howard F. Wehrle, Kansas City, Mo.
Randall Foster, St. Louis, Mo.
H. E. Morin, San Diego, Calif.
Lt. Col. C. C. Culver

Membership Committee
F. B. Patterson, Dayton, Ohio
Ralph W. Cram, Davenport, Iowa
W. F. Fullam, Washington, D. C.
John F. Ahlers, Dayton, Ohio
Dr. J. Frank Points, New Orleans, La.
Dr. R. R. Ferguson, Chicago, Ill.
Joseph Bondy, Syracuse, N. Y.
Harold Hartney, Washington, D. C.
Carl B. Fritsche, Detroit, Mich.
Charles J. Glidden, New York City

Publicity Committee
H. W. Karr, Dayton, Ohio
John Pattison, Cincinnati, Ohio
George S. Wheat, New York City
Hugh W. Robertson, Detroit, Mich.
E. N. Findley, Washington, D. C.
Archibald Black, Garden City, L. I.
Walter Camp, New Haven, Conn.
L. K. Nicholson, New Orleans, La.
Clark Howell, Atlanta, Ga.
Charles Boggs, Oklahoma City, Okla.

Foreign Relations Committee
F. S. Lahm, Paris, France
Sidney B. Veit, Paris, France
John J. Ide, Washington, D. C.
Joseph Pulitzer, St. Louis, Mo.
Prof. E. P. Warner, Boston, Mass.
Elmer Sperry, Brooklyn, N. Y.
Dr. A. L. Hipwell, Paris, France

Legislative Committee
W. P. MacCracken, Jr., Chicago, Ill.
Harold H. Emmons, Detroit, Mich.
Stephen J. McMahon, Milwaukee, Wis.
Roy G. Fitzgerald, Dayton, Ohio
Sidney D. Waldon, Detroit, Mich.
W. Frank Carter, St. Louis, Mo.
Alexander Armstrong, Baltimore, Md.
Godfrey L. Cabot, Boston, Mass.
Gould Dietz, Omaha, Nebr.
Ralph W. Cram, Davenport, Iowa
Melvin M. Johnson, Boston, Mass.

World's Largest Airship Nearing Completion

ZR3, Built by the Zeppelin Co. for the U. S. Navy Department To Cross Atlantic Next Spring

The rigid airship in its modern form is a German conception which received its highest development by the Zeppelin Co. at Friedrichshafen, Germany, founded by Count von Zeppelin over twenty-five years ago. Germany, under the Versailles Treaty, was restricted by the Allied Powers from building other than commercial airships of a gross capacity not greater than 30,000 cu. m. This size is too small to warrant the effort of creating strictly commercial types, while to cross the Atlantic in such a small ship would be an impossibility.

The Allied and Associated Powers, however, made an exception to this restriction, for they authorized the United States government to have constructed in Germany a rigid airship of 70,000 cu. m. capacity, nearly two and one half times as large as Germany is ordinarily permitted to build; this ship to be subject to the condition that it will not be used for military purposes.

Embodies Latest Practice

The United States Navy Department is the government department charged with the development of rigid airships. The Navy Department accordingly entered into negotiations with the German government and the Zeppelin Co. to construct a commercial type airship of approximately 70,000 cu. m. capacity, and upon its completion to deliver it by a German crew to the U. S. Naval Air Station, Lakehurst, N. J. This airship was to include the very latest knowledge of the Zeppelin Co., particularly as regards provisions for adequate strength and safety.

All details in connection with these contracts were completed the latter part of June 1922, and early in July the inspectors designated to represent the Navy Department took up their residence in Friedrichshafen, where the main plant of the Zeppelin Co. is located.

The Navy Department had full confidence in the recognized ability of the Zeppelin Co., but in order that the Navy Department might be convinced that this ship would represent the "last word" known to the art, it stationed its representatives at the Zeppelin works to follow the construction day by day. The Zeppelin Co. on the other hand was anxious to demonstrate its great experience in airship building, and cordially received the Navy Department's representatives.

Size of the ZR3

The size of this airship is the same as the latest airships built by the Zeppelin Co. at the end of the war, namely, a gas capacity of 70,000 cu. m. The ZR3 has, however, been designed specially to accommodate passengers, and particular attention has been directed to all factors involving convenience, strength and safety.

The general dimensions of the ship are as follows:—

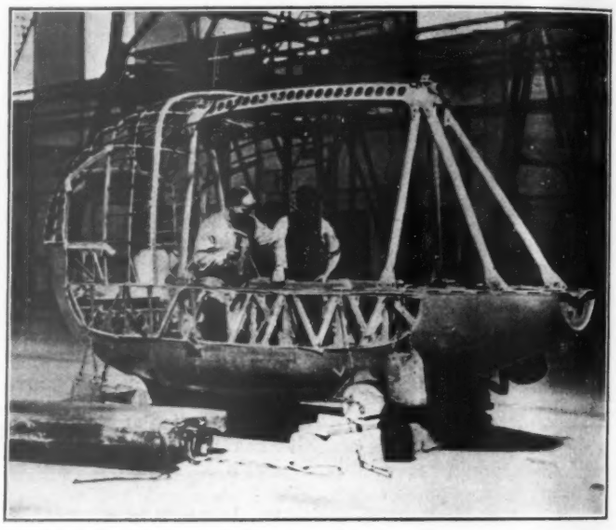
Overall length, 660 ft.
Maximum diameter, 91 ft.
Maximum width (propellers horizontal), 91 ft.
Maximum height (including landing buffers), 102 ft.

Mere figures however do not give an adequate conception of the tremendous size of this great aerial liner. Nothing like the ZR3 has ever been launched. A better idea of the ship's dimensions may be obtained by considering the size of the hangar at Lakehurst which will eventually house this "Queen of the Air." This hangar is the largest in the world and is of such enormous size that the Woolworth Building if placed on its side could be placed inside the hangar with plenty of room to spare.

Power Plant

To drive this ship through the air at a speed of 80 mi./hr. 2000 hp. is required. This is obtained from five 12 cyl. V type Maybach engines of 400 hp. each. Each engine is contained in a separate power car, and the five power cars are distributed along the under side of the ship, and supported to the airship's framework by means of wire cables and struts.

These engines, which have been designed by the well known firm, the Maybach Motor Co. of Friedrichshafen, which is affiliated with the Zeppelin Co., will contain many new features. They have been especially designed for great endurance and long life, features essential for commercial airships which will make long flights over the sea. One of the new features is that the engines are reversible, thus doing away with the weight of reversing gears. All five engines may be reversed at the same time, so that the ship's forward progress can be halted very quickly. The reversibility feature was introduced in the engines designed for the U. S. Navy submarine chasers during the World War, but this is the first time this feature has ever been incorporated in an aviation engine.

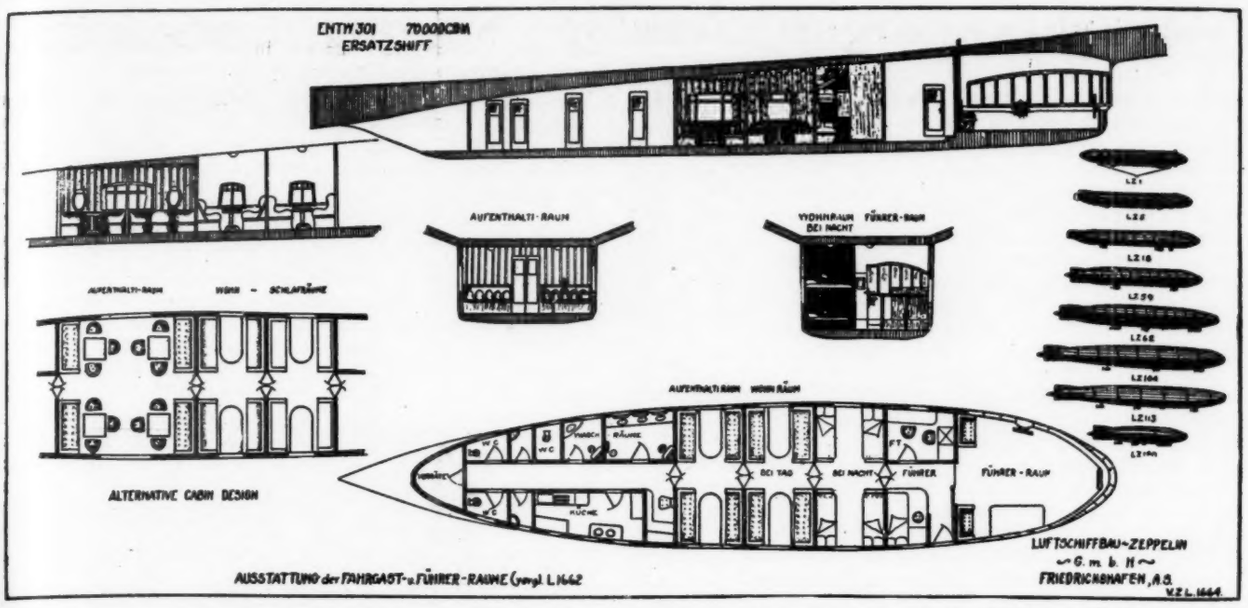


One of the five power cars of the U. S. naval airship ZR3, each of which will be fitted with a 400 hp. Maybach engine

The ZR3 will have incorporated in it many refinements of design, the results of almost twenty-five years continuous efforts on the part of the Zeppelin Co. The equipment and accommodations for passengers will be as complete and as comfortable as the Zeppelin Co. is capable of designing, with all their years of experience behind them.

Luxurious Accommodations

To get an idea of the luxurious appointments and officer's staterooms on the ZR3, which will have accommodations for thirty passengers, one has only to recall the equipment on the large ocean liners. The seating and sleeping arrangements compare favorably with the finest American Pullman cars. These quarters are arranged in the main cabin, which is rigidly secured to the keel under the forward end of the ship. The passenger cabin is also fitted with a modern kitchen equipped with electrical stoves. The guest room is divided into five compartments, each compartment seating five persons comfortably. The windows are large so as to give the passengers an excellent view of the world beneath. Travel under these conditions will be as luxurious as modern science can make it. The passengers will have none of the discomforts of trainsickness or seasickness. The motion in an airship of this size is unappreciable, and there are no other discomforts to detract from the pleasures of the journey. Recall wartime transportation accommodation for enlisted men and you can picture the crew of the ZR3, in all about twenty-four men,



Internal arrangement drawings of the car, as fitted for day and night use, of the Zeppelin airship ZR3 now building for the United States Navy

their belongings and themselves stowed away neatly in bunks inside along the corridor running all the way along the belly of the ship. Quarters are so located that each man will at all times be nearest to the scene of his duty.

The ZR3 has been fitted with bow mooring equipment so that she may be secured to a mooring mast. Opinion in the United States is that the mooring mast will prove to be the feature which will strikingly demonstrate the commercial value of rigid airships.

Extensive Trials Before Crossing

Immediately after the completion of the ship it will be filled with hydrogen gas, a total of 2,500,000 cu. ft. of hydrogen being required for one filling. To manufacture this amount of hydrogen, 300 tons of coal will be needed.

Several short trial flights of from two to four hours duration will follow, to see that all parts function properly. This will be followed by a longer flight of about 24 hr. This flight will serve as a thorough test of the engines and of all the ship's equipment, and if possible the ship will be flown into bad weather areas to prove its performance and power of resistance.

During the war it was often necessary to place the airships built by the Luftschiffbau Zeppelin (Zeppelin Co.) in service as soon as possible. On account of the great experience of this construction firm, airships were sent to the front on war service after only one or two short test flights. The ZR3 is bearing the construction number LZ126, that is, the ship includes the experience and progress of far more than one hundred Zeppelin type airships previously constructed. This great number is the best guarantee that the new ship will be the last word in the field of airship construction. It is desired however for the ZR3, to undertake a thorough test to guarantee its safety and performance.

The surest information of the airship's usefulness and performance will be obtained through this crossing from Europe to America.

The Transatlantic Flight

The trans-Atlantic flight, originally scheduled for last month, has been postponed, to take place next spring. The route from Friedrichshafen to the East Coast of the United States in a straight line is 3500 nautical miles, while the British R34 on its American flight from Scotland to New York covered an average distance of only 2800 nautical miles.

As is well known, very stormy west winds prevail on the North Atlantic ocean during the winter months. In the winter time the velocity of the west winds on the direct route at sea level is averaging 27 mi./hr. and at the altitude of flight of the airship there will be an average headwind of at least 34 mi./hr., as the winds are rapidly increasing at the higher levels. As the progress of the airship in flight will, of course, be lessened by the speed of head winds, it results that the crossing time would be considerably increased on this direct route. For instance, with the ship going at a crossing speed of 60 mi./hr. the passage would take almost 140 hr., for which reason it is probable that instead of flying the direct, northern route preference will be given to a more southerly course, where less violent headwinds are to be expected. As the average west winds in the vicinity of the 30th degree of latitude are considerably less, it is planned to fly from Friedrichshafen across southern France, passing Cape Finistere and the Azores Islands, to the south of the Bermudas and thence northward to Lakehurst, N. J. This route measures about 4500 nautical miles in length, being nearly one third longer than the direct route over the English Channel, Ireland, Newfoundland and Nova Scotia. On account of the longer flight route nothing like a new crossing record must be expected. It is estimated, however, that the ZR3 will make the passage in from 75 to 100 hr., that is, in between three and four days.

The flight will be made without any intermediate stop and the ship will be navigated by the experienced personnel of the Luftschiffbau Zeppelin. The crew on this flight will be composed of over thirty men; and gasoline alone of over 33 tons, the capacity of three railway tank cars, not to speak of the supply of oil; spare parts; water for ballast, drinking and washing; and food supplies.

Interesting Commercial Possibilities

Let us consider the performance of this airship on a regular air line, for example a route from San Francisco to Honolulu (Hawaii), a distance of 2000 nautical miles. This journey today takes a steamship about five days. Under favorable weather conditions this airship would be able to make the trip to Honolulu in a little more than 28 hr. and the return flight to San Francisco in about 36 hr., the difference being due to unfavorable winds which are likely to be found on the eastward trip. It would be possible, for example, to leave San Francisco on a Saturday morning and arrive in Honolulu on Sunday morning. The possibility of seeing the chief things of interest over Sunday would thus exist. The return trip would start in the evening and the airship could on Tuesday

morning again be in San Francisco, so that the whole journey would be only a little more than a week end trip.

On this line the ZR3 could carry thirty passengers and 15 tons of freight or baggage. The flight could be so arranged that connections would be made with steamships sailing from San Francisco to Asia, and in addition the mails could be expedited.

This airship could also be used for flights around the United States. The route New York-St. Louis-Los Angeles-Chicago-New York could be accomplished by the ZR3 in about four days (94 hr.) without the necessity for other intermediate landings; besides the crew and necessary fuel, a load of ten tons would be available for passengers and freight, that is about thirty passengers and 7 tons of mail or twenty passengers and 8 tons of mail.

On the other hand, if in addition to the crew and the necessary water ballast and equipment the ship should carry a full load of fuel, it is possible under average conditions and at a cruising speed of 60 mi./hr. to have a radius of action of 8600 naut. mi. If a deduction of 1000 mi. is made to take care of unfavorable winds (although on such long flights the influence of head and following winds almost balance as a rule) the definite radius of action would be 7600 naut. mi., that is it would be possible to fly from New York to any place on the earth within a radius of 7600 mi. If an arc of a circle be described with New York as a center and a radius of 7600 mi. it will be found that this circle lies in the vicinity of Hongkong, Rangoon, Colombo, Cape Town, Auckland (New Zealand), New Guinea, Manila and the vicinity of the South Pole, so that all parts of the world with the exception of Australia would be attainable in direct flight by this airship, if it started from New York, while Australia would be within easy reach if the start were made from San Francisco.*

Book Reviews

LES HELICOPTERES. By M. William Margoulis, Former Director of the Eiffel Laboratory. (Gauthier-Villars; Paris, 1922.)

Interest in the helicopter has been through a series of cycles. Rising to a high pitch when the future of the airplane still seemed uncertain, it subsided in ratio as the airplane's performance improved, but subsided only to rise again within the past two years, thanks to the partial success obtained by a number of inventors both here and abroad. The experiments of Berliner, de Bothezat, Brennan, Oehmichen and Karman and Petroczy, have stimulated interest again to a point where at times it has bordered on enthusiasm. It is then appropriate that the present should bring forth the first extended study of the possibilities of the helicopter and of the ways in which a helicopter can be analyzed by the application of the methods of modern aeronautical science.

M. Margoulis, long interested in the testing of propellers and in charge of much of the propeller work done at the Eiffel Laboratory, has produced a very interesting and useful book of some 90 pages. It is devoted chiefly to the explanation of methods of comparing various propellers from the point of view of their usefulness in helicopters and of predicting the possible performance of a given machine. The book includes also, however, reports on a number of tests made at the Eiffel wind tunnel, which are briefly described in such form as to be available to the general public for the first time. These tests are of particular interest because they are the first which have ever covered completely the several possible conditions of operation of a propeller, including its operation as a windmill when a helicopter is descending without power and its operation for combined purposes of propulsion and sustentation when set obliquely to the path of travel. Unfortunately, the curves expressing the results of these have been plotted on so small a scale that it is difficult to read the values directly. The shape of the curves and the general nature of the variation of the forces are indicated, however, and the conclusions which can be drawn from the curves are discussed by M. Margoulis in the text.

In addition to describing the results obtained in his own work, the author treats at some length those which have been arrived at in other laboratories and reduces them to a common basis. The most impressive feature of this part of the book is the extraordinarily good agreement among the several sets of experiments. The results secured by Durand, Bendemann and by Eiffel are all in nearly exact accord in finding that the maximum thrust is 80 per cent of the theoretical maximum as derived by Finsterwalder, Wetchinkine and others. This is true despite the wide variety of the types tested in several laboratories, and is a factor in leading the author to the conclusion that "the thrust of a two-bladed propeller working at a fixed point depends only on the diameter, the r.p.m., and the power applied." The blade form and section and the pitch have but little effect within wide limits, all of which is somewhat discouraging to those who have predicted great future improvement in the efficiency of propellers performances designed for helicopter use. Further discouragement for the over-optimistic, who have neglected to experiment for themselves, is found in the fact that none of the numerous inventions of ingenious types of propellers tested at the Eiffel laboratory have ever shown any improvement over the standard form. The thrust obtainable from a given diameter and power, for example, does not appear in any instance to have been very much increased by the use of two propellers in tandem to replace a single one.

It is rather a regrettable feature of the history of helicopter experiments that every laboratory staff has invented a new type of coefficients on a new basis of comparison. The author performs a needed service in tabulating a number of these coefficients and giving the factor of transformation from one to another, but American readers may regret that the coefficients first given currency in Technical Note No. 4 of the N.A.C.A., and since then extensively used by American experimenters, are not included.

In describing the behavior of propellers, under other conditions than that of propulsion or static sustentation it is pointed out that under some conditions the propeller acting as a windmill may have several possible speeds of rotation for a given rate of descent, and that two of the speeds may be stable. This is true, however, only when the rotating propeller is overcoming a resisting torque. For the treatment of this, as of many other problems, ingenious nomograms have been devised and reproduced in the book, some of them representing application of the Eiffel logarithmic diagram to the helicopter, while others are entirely independent of any previous method. The parallel between the helicopter and the airplane is forcibly pointed in considering the question of horizontal flight, and a study is made of the possibility of a combination of the two types of aircraft.

The problem of stability and control is hardly mentioned, and it is therefore impossible to say off-hand just what are the author's views on the future of the helicopter. On the whole, the outlook which he paints does not seem to be a bright one, particularly as regards the possibility of increasing present lifting efficiency. His discussion, and particularly that part which related to the means of attaining horizontal travel and of predicting possibilities of performance, is of great interest and should receive the attention of every prospective helicopter designer.

THE FACE OF THE EARTH AS SEEN FROM THE AIR. By Willis T. Lee, U. S. Geological Survey. 103 pp., 82 ill. (American Geographical Society, New York.)

This beautifully illustrated book deals with the application of aerial photography to geography. After explaining the development of aerial photography as a result of war requirements, the author goes on describing the different kind of aerial photographs, oblique and vertical, and their different uses in connection with map making, surveying, architecture, landscape gardening, engineering projects, geology, etc.

While the book is strictly non-technical in scope, it will be found of interest by all those interested in this most recent commercial application of commercial aviation.

*In the above article, prepared by the officials of the Zeppelin Co. mention is made of the use of hydrogen for the inflation of the ZR3. This is apparently in contradiction to the policy of the U. S. Navy to use helium in airships. However, it is explained by the fact that the ZR3 will be flown to this country under the direction and at the responsibility of the Zeppelin Co. and will not become the property of the United States government until delivery is effected at the Naval Air Station, Lakehurst, N. J.—EDITOR.

L. B. Sperry Lost at Sea

According to press dispatches from England, it is feared that Lawrence B. Sperry, the well known aeronautical pioneer and president of the Sperry Aircraft Co., Inc., of Farmingdale, L. I., was lost with his plane in the English Channel on Dec. 13, while en route from England to the Continent.

Sperry's plane, a "Messenger," was seen at noontime by workmen at Pett, 5 mi. from Rye, flying seaward at an altitude of about 500 ft. A few minutes later the ship was seen to circle back toward shore, and then fly out to sea again, when

Lawrence B. Sperry

suddenly about 3 mi. off shore, it dove into the water. It did not burst into flames and lifeboats immediately put out in the hope of rescuing the pilot, but when they reached the plane Sperry was nowhere to be found.

The searchers did find, however, an air jacket about a mile from the plane, marked with the British aircraft registration number G-EBIJ and bearing the name L. B. Sperry. An airman's chart and other articles, some bearing the words "Property of L. B. Sperry," were found near by.

The plane, identified as Sperry's by the fact that his name was painted on the fuselage, was brought to shore apparently not damaged. The engine, from a superficial examination, seemed to be in good running order.

Detective Inspector Milton, who was shooting game on the coast at the place where Sperry flew seaward, says that the aviator's engine was running badly just before the plane disappeared from view.

"Between noon and 1 o'clock," he said, "I noticed an airplane coming from inland, which held my attention because of the fact that the engine was running very badly, spitting and making a great noise. The plane was quite low, and I could distinctly see its number and colors.

"It circled round twice, and on the first circle was apparently about to land. I was quite sure of this and had started to run toward it when the plane rose and began a second circle. Obviously the airman was looking for a place to land, but afterwards he decided to attempt the sea passage.

"The spot was quite suitable for landing as the fields there were covered with short grass.

"The engine was still running in fits and starts when the airman turned his machine toward the sea and disappeared over the water into the rather thick mist. I could hear the motor running after the plane had disappeared. It seemed extremely unwise for the aviator to cross alone under such circumstances."

At the time of going to press no further news regarding Sperry's fate has been received, although rescue parties searched for the lost airman for several days. The belief, therefore, that he may have been drowned in swimming shoreward in the cold water seems unfortunately to be the only reasonable explanation of his mysterious disappearance, which will be deeply lamented by all his countless friends and admirers. AVIATION takes this opportunity of extending to the lost airman's family the expression of its sincerest sympathy in this sudden bereavement.

Lawrence B. Sperry was born Dec. 21. 1893, in Chicago, the son of Elmer B. Sperry and Zula (Goodman) Sperry. He married Winifred Allen, Feb. 18, 1918, and had two chi'dren from her. His aeronautical activities date back to 1909, when he started building his own airplane, which he flew the following year, first under tow and then with a motor. In 1911 he obtained a seaplane pilot's certificate, and became manager of the flying department of the Sperry Gyroscope Co. of Brooklyn, N. Y. In this capacity he developed a gyroscopic stabilizer for airplanes which won first prize in the French Airplane Security Contest held near Paris in 1914. The Curtiss flying boat to which this stabilizer was fitted was personally demonstrated by Sperry in France. He was the first man to join the U. S. Naval Flying Corps, on Jan. 5, 1917, and his naval service was ended by crashing an experimental flying torpedo. Nevertheless, he pursued his development work on radio-controled aerial torpedoes, succeeding last year in flying such a machine across country. This plane was a "Messenger" single seater which was built in the Sperry factory to the design of the Engineering Division of the Army Air Service.

Sperry's plucky attempt to win the On-to-St. Louis race last October with a flight from Garden City in his inseparable "Messenger"—in which he was only prevented by fortuitous circumstances; his extended use of the airplane as a "flivver," which he would land and take-off in cities and towns, and refuel at gasoline stations; his demonstration of the possibility of contacting two airplanes in flight, which promptly led to the Army Air Service's successful trials with aerial refueling and the establishing of new world's duration and distance records; and finally, his experiments with quick release landing gears and skid landings—all these manifestations of his ceaseless activity stamp Lawrence B. Sperry as a true pioneer of aviation, and one whose name will live in the annals of human flight. His untimely disappearance is therefore an irreparable loss to American aviation.

Secretary Davis Visits Dayton Fields

McCook Field and Wilbur Wright Field were recently visited by a group of distinguished visitors headed by Mr. Dwight F. Davis, Assistant Secretary of War; Gen. John F. Hines, Deputy Chief of Staff, and Maj. Gen. Mason M. Patrick, Chief of Air Service. Col. H. B. Ferguson, Assistant to Mr. Davis; Maj. James A. Mars, Chief of the Industrial War Plans Division, Office Chief of Air Service, and Lieut. Ames S. Albro, assistant to Major Mars, were also of the party.

After an inspection of Mc Cook Field, some exhibition flying was given for their entertainment. The site for McCook Field was also inspected, and the visitors expressed themselves as approving most heartily the plans for the new home for the Engineering Division.

The party visited the Repair Shops at Wilbur Wright Field and manifested great interest in the work in progress in the Aero Repair and Engine Repair Departments. Then they were driven down to see the Barling Bomber. The Assistant Secretary of War, who had never seen the huge craft before, expressed his admiration and pleasure at the size and impressiveness of the huge airplane. During a portion of the day the Secretary was in conference with Mr. Gilbert Eichelberger, Chairman of the Dayton Branch of the Industrial War Plans Committee, and Frederick B. Patterson, President of the National Aeronautic Association and President of the National Cash Register Co.

AIRPORTS AND AIRWAYS

Charting the Airways

A fine flight from Mitchel Field to Seattle, Wash. and return was recently made by Lieuts. Victor E. Bertrandias and Kenneth Garrett, A.S. for the purpose of preparing data on landing facilities and flying directions en route. The flight was started Sept. 1, and was concluded Oct. 11. The total distance flown was approximately 6500 mi. and the flying time 83 hr. 2 min.

The flight was accomplished with one standard DH4B1 airplane, equipped with a 13 gal. oil tank, a McCook Field efficiency propeller, two Sperry compasses, one air distance recorder, and one bank and turn indicator. The propeller stood up very well, and a flight in a rainstorm showed no effect upon it whatsoever. The Sperry instruments proved very accurate. The pilots carried a regular compass on the instrument board, but for some reason or other it went dead outside of Milwaukee and was useless for the remainder of the trip. The "old reliable" Liberty engine, equipped with Striker pump, performed in its usual excellent manner. The only mechanical troubles encountered during the entire trip were the changing of one voltage regulator, and two distributor heads which had developed ridges around the segments. The carburetor and Striker pump were not changed, despite the different oils and gasoline used along the route.

Standard aviation gasoline was obtained at all stopping places, with the single exception of Miles City, where it was necessary to partly refill with commercial gas. The amount of fuel used on the trip was 1579 gal. of gasoline and 422½ qt. of oil. Weather conditions on the westward trip were generally fair.

Touching on the landing facilities at the various stopping points, Lieutenant Bertrandias makes the following comments:

"At Milwaukee, Wis., there is a commercial field, known as the Milwaukee Airport. This field has one hangar, gasoline and oil service, and a large white circle in center. Field rolling.

"Landing field at Minneapolis, known as the Wold-Chamberlain Field, is very easy to pick up, being an old speedway. Aviation gasoline and oil are available.

"At Bismark, N. D., there is a government field located at Fort Lincoln. If notified in advance, the Chamber of Commerce will care for visiting pilots, making all arrangements for gasoline and oil.

"At Miles City, Mont., there is a small field which the town claims as a landing field, but as no government airplanes have landed there in the last two years no attempt has been made to distinguish this field from any other field in the vicinity.

"Helena, Mont., has a large field, which is unmarked, with two small, privately owned hangars. No gasoline or oil available on field. However, the Commercial Club, if notified in advance, will take care of visiting pilots, making all arrangements for gasoline and oil.

"At Spokane, Wash., is a commercial field known as the Foster Russell Aviation Field, owned and operated by a civilian company, which is marked with large white circle. Mr. Russell has done a whole lot in that vicinity in keeping up interest in aviation. He operates four or five paassenger-carrying planes, has hangar facilities, where minor repairs can be made, and gasoline and oil service is available.

"At Seattle, Wash., the government operates a field known as Sand Point Field. This field, practically one way and having but one hangar, is very small and is situated among some tall pine trees which makes it very difficult to pick out from the air. The service received there was very good. There are no markers on this field.

"At Manhattan, Mont., is an emergency field, with wind cone. At one time this field had a large white circle which, through being neglected, is hardly distinguishable from the air. Field has many ruts and cattle graze most of the time on it. However, a landing can be made on this field without any difficulty. Commercial gasoline is available in town."

Lieutenant Bertrandias' report will include descriptions of the airways between Chicago, Milwaukee, Wis.; Minneapolis, Minn.; Fargo, N. D.; Bismark, N. D.; Miles City, Mont.; Helena, Mont.; Manhattan, Mont.; Miles City; Helena to Spokane, Wash.; Spokane to Seattle, Wash. The above data will form the basis for future Aeronautical Bulletins which are published from time to time by the office of the Chief of Air Service.

Chicago News

By Otto Klein

Great secrecy surrounds the sudden departure of Nimmo Black for Central America. Black left Monday morning, Dec. 10, in his Laird Swallow, headed for Cuba, from where it is said he will cut across the Caribbean to Central America.

Mlle. Adrienne Bolland, who recenty looped the loop 98 times in 58 min. and who is engaged to marry Henri Pitot, the French aviator

This is probably the first time that an OX motored ship will undertake such a long and dangerous flight, and the story of Black landing amid alligators and rattle snakes of the unexplored regions should make a fascinating story. Black's only encouragement on his trip to parts unknown is contained in the film "The Broken Wing," in which it is proved that a plane can find spare parts even at the most isolated ranches in Mexico and can procure high test gas for the return journey somewhere at a corner gas station in the cactus filled desert.

The Chicago Air Park flying field at 63rd Street has been closed for the winter months.

Michael Rubner has taken an extensive flying trip through Ohio. Lieutenant Hayth arrived at Checkerboard field Dec. 9, from Detroit in a DH, carrying four passengers. John Miller has lately carried several passengers to the Great Lakes Naval training station in his JN, landing in a small athletic field.

The Heath Airplane Co. is experimenting with a Miller carburetor installed overhead in an OX5 engine.

Kansas City News

By T. S. Jewett, jr.

On Nov. 27 The Kansas City Chapter of the National Aeronautical Association held its first business meeting and elected the following men as officers and directors; Pres. Howard F. Wehrle, Vice Pres. Walter H. Miller, Secty. E. F. M. Deeds, Treas. Cliff Hogan; Directors: Mayor Frank Cromwell, Robert Lester, Bryce M. Smith, Fred Harvey, and M. G. Eitelman. The Chapter starts with a membership of 117 men and women of Kansas City, everyone of whom is interested in aviation.

Activities at Richards Field were on the increase last month due to the fine weather and the successful passing of 40 officers out of 50, of the Air Service Reserve Corps, by Capt. F. C. Venn, Flight Surgeon of the 7th Corps Area, of their physical examinations. The flying time for the month was 111 hr. 50 min.

The following student officers from Ft. Leavenworth, Kans., have flown a total of 16 hr. 10 min.: Majors Wm. C. Sherman, Maxwell Kirby, Wm. C. McChord, J. A. Dargue, H. C. K. Muhlenberg, and R. E. Coker. The following Reserve Officers of the 8th Attack Wing flew for a total of 57 hr. 40 min.; Maj. R. E. Spake, Capts. F. B. Harvey and T. L. Dawson, Lts. B. W. Diggle, G. B. Grogan, W. T. Atkinson, and W. M. Campbell. Lt. Jas. B. Carroll flew for a total of 38 hr. in tests routine and instruction. Lieutenant Carroll made one cross-country during the month to Fairfield, Ohio, to ferry back another DH for the use of the officers flying at the local field.

On the average one transit Army ship has passed through each day for the month, the biggest of which were the Martin Bombers under the command of Capt. A. B. Mc Daniel and Lt. L. A. Smith from Mitchel Field to Kelly and Lieutenants Johnson and Maze. The Airways ship, from Kelly to St. Louis through here on Tuesdays and Wednesdays, has missed one day and that was due to the biggest snow storm experienced by Kansas City since 1918.

On Dec. 18 The First Annual Ball of the 8th Attack Wing, O.R.C., was held in the University Club of this city.

F. H. Reid, pilot for the Lincoln-Standard owned by Woolf Bros., a local clothing store, has stored his ship for the winter and will not resume flying till the first call of spring. C. C. Melton has the engine out of his "Houpiezine", the Ford motored plane, and is giving it a much needed overhauling as nearly every visiting pilot on the field wants to try his hand on such a tiny ship. W. E. Proach is overhauling and rebuilding his "Canuck". Jim Coburn and Van Gregory, composing the Aerial Photo Co., have traded their two LS's for a new LS5, and have gone to Gentry, Ark., for a short time to rebuild a Laird Swallow. Their return is expected soon. Ralph Beal has sold his ship and is going to rebuild a new job along his own lines. Ben Gregory made eight trips to Richhill, Mo., carrying passengers to the new hunting club opened there by men of this city. He is also completing his instructions to H. E. McCumber who took his 6th solo last week. B. M. Tuxhorn is teaching three students to fly and expects to graduate them soon. A few days ago when thirteen convicts from the prison at Lansing, Kan., escaped, Tuxhorn was called on to help try to spot them from the air. Several have been caught as the result.

Consolidation of British Air Lines

An agreement has been reached on the plan of the British Air Ministry for the organization of a new air transport company which would absorb all the principal companies now operating in England. The capital of the new company has been fixed at £1,000,000.

A board of directors has been selected, consisting of two representatives of the Air Ministry, two representatives of the banking interests concerned, and one each from the Handley-Page Transport, Ltd., the Daimler Airway, the British Marine Air Navigation Co. and the Instone Air Line.

The actual consolidation of the four operating companies will be effected gradually, but will probably be completed by March 31, 1924. The present machines (Napier-De Havilands, Handley-Page WS8B, and Supermarine Sea Eagles) will be continued in service, but reallocated to the routes for which they are best adapted.

The new company proposes to make a special effort to increase the quantity of merchandise it carries, but will of course continue all its existing passenger services. For the present it will operate the following routes:

(1) London-Paris-Zurich.
(2) London-Brussels-Cologne-Prague.
(3) Manchester-London-Amsterdam-Hamburg-Berlin.

At a later date it is hoped to extend the British airways to the principal points in Central Europe, and to establish the much discussed London-Constantinople-India service.

Vought Engineer Resigns

Val Constedt, until recently chief design engineer of the Chance Vought Corp. of Long Island City, N. Y., resigned from the corporation at the end of November.

Mr. Constedt received a thorough technical aeronautical education abroad where he did considerable flying and acted for about a year as design engineer for one of the Swedish aircraft manufacturers. Among 300 applicants he was selected for the Swedish Government's scholarship for extension of aeronautical training and in this capacity he visited the principal aircraft plants in Europe, making studies of plant organization, design and manufacturing methods.

In the United States Mr. Constedt, besides his connection with the Vought Corporation, was engaged for about a year in the structural and aerodynamical departments of the Curtiss Aeroplane & Motor Corp.

French Engine Competition

Cash prizes totalling two million francs are offered by the French government for an aeronautical engine competition to be held during the coming year. The object of the competition is to encourage the construction of aviation engines developing from 350 to 450 hp. and capable of running for long periods with the minimum of attention, thus giving the maximum guarantees of security in flight. After preliminary tests in the air and on the bench, the engines will have to undergo a 240 hr. brake test, in periods of 8 hr., during which all accidental stops will be penalized. Fuel consumption will be controlled throughout the trials, and will be taken into consideration in making the final rewards.

The total number of engines entered for this competition, which is the most important of its kind in the world, is twelve. With the exception of Fiat, which entered at the last moment with one engine, all the competing firms are French, and comprise Renault, Bréguet, Lorraine-Dietrich and Hispano-Suiza with two engines each, and Salmson, Peugeot, and Panhard-Levassor with one engine each.

Chinese-Built Airplane

A two-seater tractor biplane, with a 160 hp. Mercedes engine, has just been finished at Lunghwa (near Shanghai), China. Every part of the plane was made by workmen who began without the slightest knowledge or experience of this class of work. The machine was designed and built by F. L. Schoettler.

The principal characteristics of this machine are:—Span, 39 ft. 6 in.; chord, 5 ft. 6 in.; length, 27 ft. 4 in.; wing area, 411 sq. ft.; weight empty, 1634 lb.; weight loaded, 2558 lb.; speed range 45-122 mi./hr.; endurance, 4½ hr.

Prague Airplane Show, June, 1924

The Czecho-Slovak Aero Club intends to hold its third international aircraft exposition from June 3 to 11, 1924, at Prague. Domestic exhibits, it is expected, will include large-type machines. The Cesko-Moravska-Kolben Co., at Prague, is now producing a certain number of airplane motors on order from the Czech government. Hitherto the limited number of planes built in the country have been equipped with foreign motors.

The address of the Czecho-Slovak Aero Club is: Ceskoslovensky Aviaticky Klub, Palac Ceske Banky, Vodickova ulice, Prague II.

Stromberg After Foreign Contracts

W. E. O'Neil of the Stromberg Carburetor Co. recently sailed for Europe for the purpose of securing 1924 contracts for the company's products. New equipment which the company is now manufacturing will result, it is hoped, in increasing its foreign business.

U. S. ARMY AND NAVY AIR FORCES

U. S. ARMY AIR SERVICE

Specialized Flying Training at Kelly Field

Specialized training in the four branches of aviation began at the Air Service Advanced Flying School at Kelly Field, Tex., on Nov. 5. The students now on duty at the Advanced Flying School have been assigned to the four branches of training, as follows:

Pursuit training—2nd Lts. Benj. W. Chidlaw, H. M. Wittkop, Townsend Griffiss, John S. Griffith, O. R. Cook, Cadets Jesse B. Stowe, Dean W. Burford, John A. Collins, Chas. N. Wisely, S. A. Gilkey, Wm. H. McArthur and Marius C. J. Markle.

Bombardment training—Capt. R. C. Candee, Second Lts. R. E. Snavely, C. E. O'Connor, M. E. Gross, Alfred A. Kessler, Hugo P. Rush, Cadets Frank F. Ray, Archie R. Loomis, Leroy Manning, Geo. W. Allen, F. V. Tompkins and F. J. Schwaemmle.

Attack training—Majs. O. Westover, Wm. B. Duty, First Lt. F. W. H. Kimble, Second Lts. James W. Spry, Milton Long, Cadets A. S. Smith, Geo. A. Weis, L. C. Sherman, L. G. Fritz and Schuyler Priestly.

Observation training—Maj. R. E. Rowell, A.S., M.C., Capt. Willis H. Hale, First Lts. Byron T. Burt, F. E. Hopkins, Wm. V Andrews, Second Lt. L. C. Catlett; Cadets Chas. H. Earnest, Julius W. Johanpeter, C. E. Smith, John G. Kliemand, Milton M. Murphy, Rodney S. Lamont and Earl W. Fleet.

Barling Bomber Makes New Records

On Oct. 25, in the course of regular performance tests, the Barling Bomber piloted by Lieuts. Harold R. Harris and Muir Fairchild, with Douglas Culver as engineer, took off carrying 2,000 kg. of bombs and reached an altitude of 6,800 ft. Over the speed course a speed of 95.5 mi./hr. was attained. Official representatives of the Fédération Aéronautique Internationale were present.

On Oct. 27 the bomber again took off, this time carrying 3,000 kg. of bombs, and reached an altitude of 5,000 ft., establishing the altitude and endurance weight carrying record for this load. F.A.I. officials observed this performance also. A mechanic and radio engineer were carried as dead weight. The fuel carried comprised 365 gal. of gasoline and 72 gal. of oil.

The Barling Bomber has recently been equipped with radio, which increased the weight by 82 lb. The total load of the bomber as it took off was 37,435 lb.

Having obtained the altitude and endurance records for 2,000 and 3,000 kg. it planned to make another flight in the near future carrying 4,000 kg. of bombs and establish this record also.

Radio Instruction at France Field

Several weeks ago an order was issued at France Field, Panama Canal Zone, requiring all the officers to attend radio school and qualify in radio telegraphy. Two classes per day are held, one primary class and the other advanced. At present more than 50 per cent of the officers can take more than ten words per minute and all can take five. After all officers have qualified they will be required to keep in practice by taking weekly tests.

San Antonio Air Depot

The consolidated report for July, 1923, of flying time for the Air Service of the United States and its foreign possessions shows that 41 per cent of all flying performed for that month was in ships rebuilt or overhauled at the San Antonio Air Intermediate Depot.

Transcontinental Round Trip Completed

A Martin Bomber, capable of carrying 2400 lb. of explosives, 300 gal. of gas, 26 gal. of oil, or a total load of approximately 10,000 lb. including military equipment, landed safely at Langley Field, Va., on the last leg of its round trip flight to the Pacific Coast. The ship was piloted by Lieuts. J. F. Whiteley and H. D. Smith, with Sergeants K. T. Weidekamp and A. B. Jewell as mechanics, all of the Army Air Service, and regularly stationed at Langley Field. The primary purpose of the flight was to determine the adaptability of a plane of such large capacity type as the Martin Bomber for regular travel along the Air Mail route, both for commercial and military purposes.

The flight from Norfolk to the Pacific Coast was made in ten stages. Starting on Sept. 15, the airmen made stops at Dayton, O., St. Louis, Mo., where they witnessed the airplane races, and Fort Leavenworth, Kan., where they participated in an aerial demonstration, after which they followed the Air Mail route and touched North Platte, Neb; Cheyenne, Wyo., Elko, Nev., Reno, Nev., Mather Field, Sacramento, Calif., and Crissy Field, San Francisco.

The aviators experienced considerable difficulty in negotiating the stretch of territory from Rock Springs, Wyoming, to Salt Lake City, Utah, on account of the low ceiling of their plane. It reached its maximum altitude at 9500 ft. and barely skimmed the ground above the vicinity of Lyman, Wyo., where, owing to the thin air, the plane settled about 1500 ft. and flew 50 ft. above the ground.

The return trip from the Pacific coast was made via Yuma and Tucson, Ariz., El Paso, Sanderson, San Antonio and Dallas, Tex., Muskogee, Okla., Kansas City, Mo., St. Louis, Mo., Dayton, Washington.

Across the United States and back in a Martin Bomber—The Army Air Service pilots and mechanics who did it (see story above)

L. to R.: Lieut. H. O. Rogers, Lieut. H. D. Palmer, Sergt. B. F. Belcher and Sergt. P. P. Tolusciak, of the Marine Corps, who just completed their 11,000 mi. flight

U. S. NAVAL AVIATION

Preparing the Polar Flight

The Naval Arctic Air Board, appointed by Secretary Denby, has been meeting frequently since its formation last week. The Board has called in experts on different phases of arctic exploration, and is considering the various forms that the expedition might take to best insure its success. The use of the airship Shenandoah is being considered, as is also the proposition of making the flight with planes, or both.

With a view to increasing the lift of the Shenandoah, the possibility of inflating her with hydrogen was considered by some airship officers. However, Secretary of the Navy Denby has ruled that helium alone shall be considered in the plans for the Arctic flight. In a memorandum to the Board, the Secretary of the Navy writes:

"The Board will, in its consideration of the possible use of the U.S.S. Shenandoah for Arctic exploration, consider only the use of helium for inflation purposes."

The geography of the regions bordering on the Arctic Ocean is being studied by the Board to determine the best point from which the expedition might start in the exploration of the unknown territory. It has been emphasized that the expedition will not be "a dash to the Pole," but rather will have a scientific character, and many discoveries of use to mankind in general are confidently expected as results of the project. The Board will continue the meetings until definite plans have been formulated and submitted to the Secretary for his approval. Letters have been received from Arctic explorers, offering their assistance, and wishing the Navy's expedition much success.

The Aerological Section of the Bureau of Aeronautics has been busy for the past few weeks collecting data on weather and ice conditions for use in the Arctic by the proposed Naval Arctic Expedition. Lieut. F. W. Reichelderfer, in charge of the Aerological Section, has been called upon a number of times to give information to the Board on weather conditions in the Arctic. In getting together this information the data obtained from the meteorological logs of vessels that have been in the higher latitudes, as well as data from the few observatories that exist in the far north has been supplemented by the logs and publications of various Arctic explorers.

Possibility of finding land in the vast unexplored area of a million square miles which lies between Point Barrow and the North Pole was pointed out to the Board by Lt. Comdr. Fitzhugh Green, member of the MacMillan polar expedition of 1917. The probable existence of this land is a strong argument in favor of Alaska as a starting point for the polar flight.

Commander Green pointed to the recent development in coal mining which has made Spitzbergen of high economic value. He said that Spitzbergen, on the European side of the Pole, was in line with the volcanic Iceland area; and that the Aleutian Island volcanic chain was evidence that similar land might be found in the million square-mile "blind-spot" which a flight from Point Barrow would cover. The closer distance to the Pole of Etah was considered by some members of the Board, but Captain Bartlett, and other polar explorers, have pointed out that the ice in the region of Etah would make it difficult to establish a base there.

Commander Green's theory of land mass in the Arctic region was supported by scientific testimony brought out by men who have skirted the area.

Possibility that observations of air currents would be of value in weather prediction was also brought out. One point in Canada is popularly famous as being "the place where the weather comes from"—that is, Medicine Hat, where many of the storms brew.

Marines Complete 11,000 Mi. Flight

The second longest flight in the world, and the longest American flight, has been completed by four Marine Corps aviators. The men, Lieuts. F. O. Rogers and H. D. Palmer, with Sergts. B. F. Belcher and P. P. Tolusciak as mechanics, covered 10,953 mi. in their flight which started from Port-au-Prince, Haiti, on Sept. 19 and ended at the same place on Dec. 8, after having twice crossed the American continent. The same engines were used in the two DH4B planes for the first 8,600 mi. The excellent results of this extended flight demonstrate the high degree of efficiency at which the aviation units of the Marine Corps are maintained, and was a remarkable test of the enduance of the aviators.

Liberty Engine Giving Exceptional Service

Installed on Oct. 18, 1922, in an HS2L seaplane, a Liberty engine at the Naval Air Station at Hampton Roads has had continual service since that time with no major repairs. The only attention that the engine has received in the nature of repairs is the renewal of the breaker points, which was done once. This engine has made 240 hr. 55 min. flying time, and is still going strong. In view of the fact that much of this time is represented by training flights, in which the engine received unusually hard service, this mark is considered quite exceptional.

DT4 with New Gasoline Tank

A flight of 2,300 mi., from the Naval Air Station at Anacostia, D. C. to the Naval Air Station at Pensacola, Fla., and return, was completed on Dec. 6 by Lieut. F. W. Wead, U.S.N. The flight was made in a DT4 seaplane, with an extra torpedo shaped gasoline tank carried in place of the torpedo or bombs usually carried on service flights. The purpose of the flight was to test the plane with this new tank, and also to test the operation and fuel consumption of the Wright T2 engine, with which the plane is powered.

Boston Reserve Air Station

Four students at the Naval Reserve Air Station at Squantum, Mass., near Boston, are continuing their aviation training at that station at their own expense after having completed their tour of duty, according to a report received from the commanding officer. This shows excellent spirit on the part of the students taking the course at the station, and is a good indication of the interest in aviation that has been aroused by the Naval Reserve Air Station at Squantum.

VT Squadron Twenty on Way to Asiatic Fleet

VT Squadron Twenty, recently organized at the Naval Air Station at San Diego, Calif., embarked on the U.S.S. Vega for the Asiatic Fleet last week. Lt. Comdr. G. D. Murray is the commanding officer of the squadron, and has with him the following officers: Lieut. John G. Farrell, Lyman C. Avery, Marshall R. Greer, Earl B. Brix, James D. Lowery, William S. Hactor and Lieut. (j.g.) Frederick W. McMahon.

Orders to Officers

Comdr. Robert W. Cabaniss, detached U.S.S. Wright, to Naval Aircraft Factory, Navy Yard, Philadelphia.

Lt. Comdr. Charles P. Mason, detached Bu. Aeronautics, to VS Squadron 3, Naval Air Station, Anacostia, D. C.

Lt. Comdr. Allan G. Olson, detached Officer in Charge Helium Production Plant, Fort Worth, Tex., to Battle Fleet.

Lieut. Thomas P. Jeter, detached Aircraft Squadrons Scouting Fleet, to VS Squadron 3, Naval Air Station, Anacostia, D. C.

Lieut. Henry C. Kellers, (MC), detached U.S.S. Sapelo, to Naval Air Station, Hampton Roads, Va.

Lieut. Joseph B. Logue, (M.C.), detached Naval Air Station, Hampton Roads, to Nav. Hosp. Norfolk, Va.

Lieut. Robert Poole, detached Aircraft Squadrons Battle Fleet, resignation accepted 12-26-23.

Lieut. John D. Price, detached Aircraft Squadrons Battle Fleet to Naval Air Station, Anacostia, D. C.

Lieut. Ben. H. Wyatt, detached Aircraft Squadrons Battle Fleet to Naval Air Station, Anacostia, D. C.

Lieut. (jg) Theodore G. Haff, detached U.S.S. Kane, to temp. duty, U.S.S. Wright.

Lieut. (jg) William M. Hainer, detached U.S.S. Brainbridge, to temp. duty, U.S.S. Wright.

Lieut. (jg) William M. McDade, detached Office Nav. Insptr. Mach. Wm. Cramp and Sons Co., Philadelphia, to temp. duty, U.S.S. Wright.

Lieut. (jg) Giochino Varini, detached Naval Air Station, Hampton Roads, to Aircraft Squadrons Battle Fleet.

Ens. John K. Lynch, detached U.S.S. Tulsa, to temp. duty U.S.S. Wright.

Ens. Edward A. Maher, detached U.S.S. Utah, to temp. duty U.S.S. Wright.

Gun. Leroy H. Ripley, detached Aircraft Squadrons Battle Fleet to 16th Nav. Dist., duty with VT Squad. 20.

Phar. James A. Wright, to Nav. Hosp., Naval Air Station, Pensacola, Fla. (orders 11-27-23)

Lieut. (jg) Joseph F. Bolger, det. U.S.S. Charles Ausburn to U.S.S. Wright.

The following officers have been ordered to the Naval Air Station at Pensacola, Fla. for temporary duty under instruction: Lieut. Miles E. Browning; Lieuts. (jg) Samuel H. Arthur, Frederick R. Buse, John F. Crewe, William L. Eagleton, John P. Graff, Leo L. Pace, Kilburn H. Roby, George A. Seitz, Bruce Settle, Roy M. Signer, Felix L. Baker, Allen D. Blackledge, Charles C. Ferrenz, Artyn L. Main, Gordon A. Patterson, Merril F. Sproul, Elmer S. Stoker, Max Welborn; Ensigns William H. Beyrer, Frederick G. Kahn, Silas B. Moore, Charles S. Alexander, Charles R. Brown, Francis D. A. Ford, Leslie K. Pollard.

First CS1 Plane Delivered

The first of the CS1 planes has been delivered at the Naval Air Station at Anacostia, and passed its contract requirement tests as a seaplane last week. The plane had previously passed the required tests as a landplane at Garden City, L. I. It had flown to Anacostia from there.

The CS1 is a three purpose plane for torpedo launching, bombing and long range scouting, and is adaptable for use either as a seaplane or as a landplane. It is powered with a Wright T2 engine. Work on the additional CS1's and the CS2 is progressing satisfactorily. These two types of planes are being built by the Curtiss Aeroplane and Motor Co., from plans and specifications furnished by the Bureau of Aeronautics.

VO Squadron Six Being Organized

The organization of VO Squadron Six is taking place at the Naval Air Station at Hampton Roads, Va. Lt. Comdr. A. E. Montgomery will be the commanding officer. VO Squadron Six will be a part of the Aircraft Squadrons Scouting Fleet, and will be composed of MO1 planes.

The first two of these planes has been shipped from the Glenn L. Martin factory at Cleveland and the remaining planes will be shipped some time this month. This Squadron will not go South with the Fleet with the other units of the Aircraft Squadrons Scouting Fleet this winter, and will base at Hampton Roads for preliminary training.

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PUBLISHER'S NEWS LETTER

Sometimes a typographical error has unfortunate consequences. In our December 3 issue a typesetter generously added a cipher to the duration time of the flights of Pilot M. A. C. Johnson, who made 380 hops in seven hours. Our type gave the average duration as ten minutes each, whereas it should have been one minute each. Some of our slide rule friends called our attention to the fact that by their calculations this would mean that Johnson did sixty-three hours of flying in four. Another correspondent wrote "Mr. Johnson need have no fear of his record ever being surmounted unless it is with a jumping jack (helicopter)." Let us hope that others will take a day off and try for this record, as it is a very interesting form of flying practice.

* * * *

A friend of AVIATION in Paris writes to us that the interest in the race meet next year has been greatly stimulated by the visit of Mr. G. S. Johns who extended an invitation from the N.A.A. to foreign entries. He writes:

"That was a very nice article that you published in the November 6 issue of AVIATION concerning Mr. Johns, and I am taking pleasure in calling the attention of the Officials of the Aero Club here and several constructors, who met him, to it. This, however, is hardly necessary as I find that about everybody takes AVIATION over here. It is universally read and appreciated."

Letters of this kind are as much appreciated as a great volume of subscriptions from those whose interest in aeronautics is general. There are three types of specialized magazines—class, technical, and trade. AVIATION has tried in its limited way to cover the last two fields, adding to these the news as it comes each week. Appealing, as it does, to those with a specialized interest in flying, AVIATION does not publish general articles or illustrations that have only a pictorial interest. It aims to be a paper for those who know aviation and want the facts presented from the flier's or the engineer's standpoint. We are glad to hear that this policy is appreciated abroad.

* * * *

And while we are on the subject of foreign interest in aviation, we might make reference to the Russian "Air Fleet Journal," which comes to us regularly. This publication of about 160 pages an issue appears monthly, and even in Russia the advertisers seem to wish to keep the good will of the government, for there are forty-one announcements in the last issue. The cover is of interest, as it shows a clenched fist emerging from a swiftly moving airplane and bears the caption "Ultimatum." The chagrin of Russia at not having an air force to cope with that of Great Britain during the recent diplomatic difficulties is expressed in the following appeal: "Strengthen the military powers of the Soviet Republic and that will end having to give concessions to Imperialistic Governments. Build up the Red Aerial Fleet for future warfare. The Soviet Government, in memory of the English ultimatum, therefore calls to all citizens to subscribe towards the creation of an efficient aerial fleet." Filled as it is with technical articles, it indicates that the statement of Trotsky that "in the air all nations start equal" is being taken literally in Russia.

* * * *

Occasionally a reader writes and asks why we do not use larger type in the text so that it would be easier to read. This is a very proper question. and probably other readers will be glad to know why we use about the same size type as the *Saturday Evening Post*, the widest read publication in the world. The reason is that we can give our readers in ten pages what other publications take fifteen or twenty to cover. For this reason alone do we keep the size of our type to that used by the leading magazines. If they can be read, surely the eyes of AVIATION'S readers are much better and can read AVIATION'S type without a magnifying glass. And they get just that much more good reading!

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AIRPLANE EQUIPMENT

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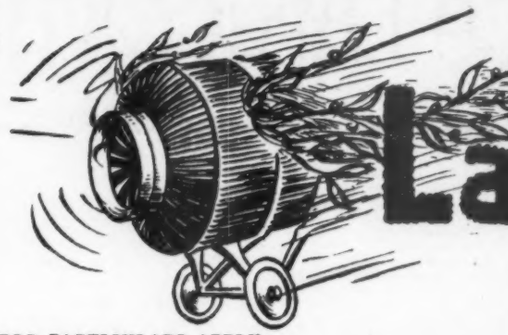

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